

**LIVERPOOL HOSPITAL SITE  
CONCEPT PLAN FOR  
REDEVELOPMENT**

***Traffic, Transport and Parking  
Assessment Report***

August 2006

Reference 0635

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## EXECUTIVE SUMMARY

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*The Sydney South West Area Health Service has prepared a Concept Plan for a major redevelopment of Liverpool Hospital. The Director General of the Department of Planning has responded to identifying the Environmental Assessment Requirements for the Concept Plan.*

*The Traffic, Transport and Parking Assessment undertaken for the Concept Plan responds to the Director General's requirements in the following:*

**\* Proposal Description – Road Hierarchy/Layout, Access and Carparking Provision**

*The location of Liverpool Hospital affords convenient ready access to/from the arterial road system serving the South-West Region of the Metropolitan area. The site is situated immediately to the south and east of the Hume Highway arterial route.*

*Access to the Highway provides easy connection to:*

- the Cumberland Highway arterial route to the north*
- the M5 Motorway arterial route to the east*
- the South-Western Motorway arterial route to the south*
- the Elizabeth Drive arterial route to the west*
- the Newbridge Road and Heathcote Road arterial routes to the east and south-east.*

*In the local context the hospital site is accessed along the Liverpool CBD ring road system.*

*The concept plan for the hospital redevelopment recognises the sensitive environment on the existing immediate access road system with major school frontages, public transport activities and significant pedestrian movements. The Concept Plan provides for the provision of a new segregated access road connecting between the northern side of the site to a new traffic signal controlled intersection on the Hume Highway.*

*The new access road will connect into the centre of the site where a proposed vehicle bridge will span the railway corridor providing linkage to the eastern part of the site. The new internal roadway will connect to the existing roadways on the western part of the site along the extensions of Elizabeth Street and Campbell Street. The proposed new access link and internal roadway arrangements will provide for a very flexible and efficient vehicle access and circulation outcome.*

*The existing on-site carparking facilities will be substantially augmented to provide for an existing shortfall as well as the future increased parking demands of staff, patients and visitors. Provision is envisaged for some 886 additional parking spaces largely contained in multi-deck structures being:*

- *an extension of the existing multi-deck carpark in the western sector*
- *a new multi-deck carpark in the eastern sector.*

**\* Transport, Traffic and Access**

Strategic Transport policy Matters:

*The Traffic, Transport and Parking Assessment undertaken identifies and addresses the relevant Strategic Policy Matters including:*

- *the Metropolitan Strategy*
- *the State Environmental Planning Policy (SEPP 66)*
- *the State Environmental Planning Policy (SEPP 11)*
- *Liverpool LEP 1997 and Liverpool City Centre DCP 2003.*

Opportunities to Minimise Traffic on Sensitive Road Frontages:

The proposal to incorporate a new separate access road connecting directly to/from the Hume Highway responds to the issue of the sensitive road frontages at the western part of the site. The proposed new road will act to both accommodate the new additional traffic movements generated by the redeveloped hospital as well as some of the existing movements resulting in a nett reduction of vehicle movements on the sensitive road frontages.

The proposed design of the new access road has had regard for the residential frontage along Hart Street and will largely be separate to the Hart Street property access road.

Efficiency of New Roads, Access, Circulation, Carparking and Drop-off Arrangements:

Access: The proposal will incorporate some 5 principal points of vehicle access ensuring flexibility and efficiency without any undue concentration of movements in sensitive areas:

Circulation: The proposal will provide very flexible segregated (hospital only) internal circulation roadways with a minimum of interaction with pedestrians and other movements. In particular, the proposed bridge over the railway corridor will ensure ready connection between the western and eastern sectors.

Parking: The principal carparking facilities will be easily accessed without undue intrusion into the site. The main staff carpark will be located just on the eastern side of the railway corridor with a pedestrian bridge link.

Drop-Off: The existing 2 set-down/pick-up facilities will be substantially augmented with a new area accessed by the proposed new road link to the Hume Highway.

Efficiency of Emergency Vehicle Access

The close proximity of the site to the arterial road system affords ready access for emergency vehicles. This access will be augmented with the proposed new northern road connection while the proposed bridge over the rail corridor will also facilitate the alternative access to/from the east (without the need for an 'at grade' crossing of the rail lines).

Proposed Access from the Wider Road Network as well as Opportunities and Constraints of Alternative Vehicular Access Points:

The proposed new road link will ensure that access to/from the Wider Road network is optimised.

Measures to Promote Public Transport Usage and Mode Share

The hospital has and will continue to have particular considerations in relation to this issue. There are considerations in regard to:

- significant early morning starts for staff as well as night/weekend shifts
- the public transport system is reliant on further development particularly into the new south-western sector release areas
- the existing satisfactory mode share for patients and visitors
- the already existing convenient access to rail and bus services.

The measures proposed to maintain and improve public transport usage and mode share will include:

- the development, implementation and maintaining of a meaningful 'Transport Plan' for the hospital
- the encouragement of increased 'car pooling'
- the improved access and amenity of the nearby railway stations
- the improved access and amenity of the bus services.

It is noted that the envisaged substantial residential apartment development within Liverpool CBD will act to increase the 'walk' mode share.

Pedestrian and Bicycle Linkages:

The site already has links to the pedestrian and bicycle networks. These linkages will be enhanced with the proposed new road link to the Hume Highway where the traffic signal controlled intersection will provide crossing facilities for pedestrians and cyclists. The proposed bridge over the railway corridor will facilitate pedestrian linkage and pedestrian circulation will be a particular feature of the development concept along with the provision of facilities for cyclists.

TMAP:

The Traffic, Transport and Parking Assessment contains a TMAP prepared in accordance with the RTA Guidelines.

Consultation:

Consultation has been undertaken with the RTA and Council particularly in relation to the new access road and its connection to the Hume Highway.

# 1. INTRODUCTION

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## 1.1 INTRODUCTION

This report has been prepared for Sydney South West Area Health Service (SSWAHS) to accompany a Concept Plan Application to the Department of Planning for the Liverpool Hospital site (Figure 1).

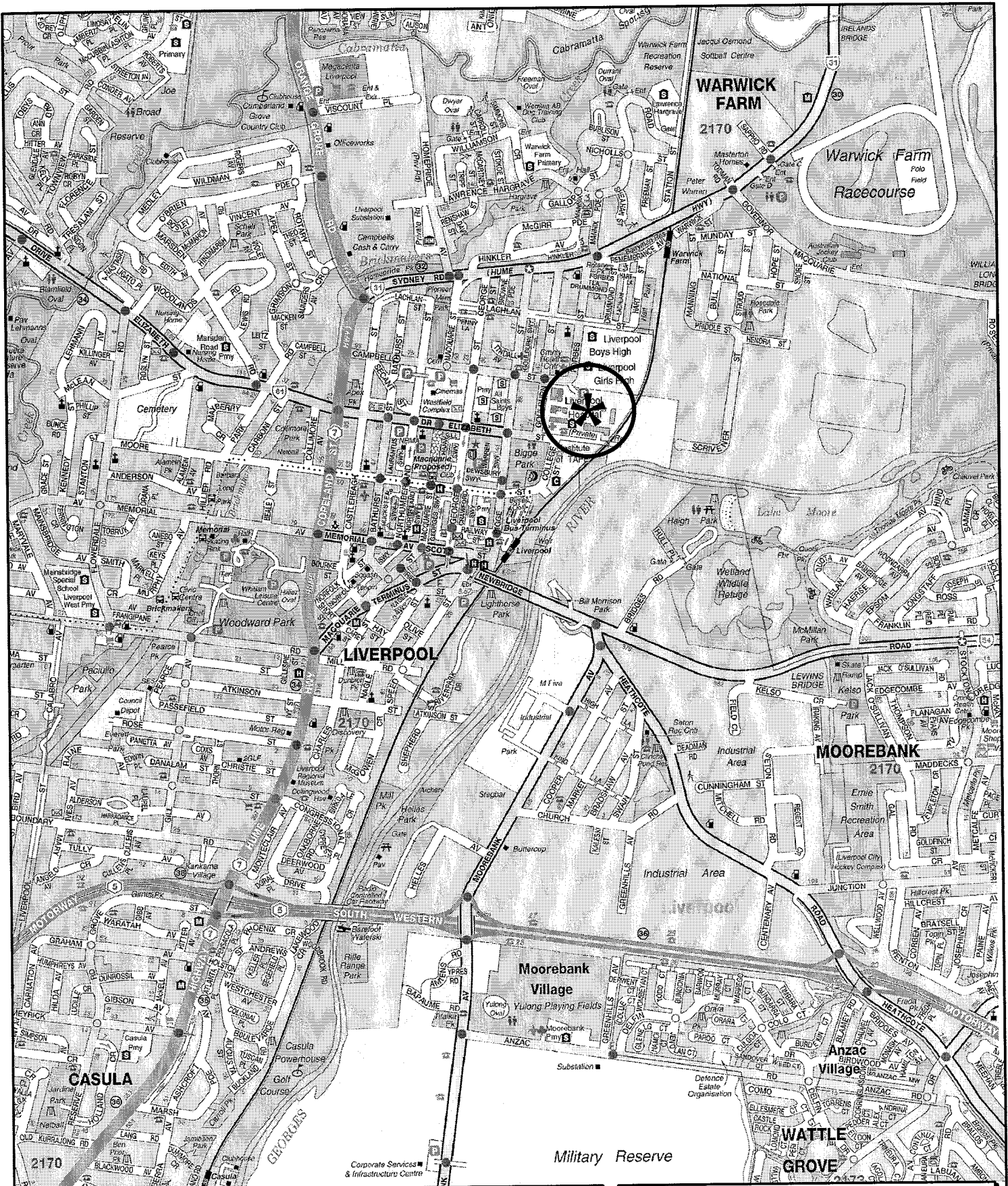
The existing Liverpool Hospital complex occupies an extensive landholding adjoining the north-eastern sector of Liverpool CBD spanning the railway line. The hospital has developed as a major regional health facility and is a tertiary referral hospital for the SSWAHS providing clinical care, research and teaching (it is a teaching hospital for the University of NSW).

The location of the hospital benefits from:

- \* ready access to the arterial road system
- \* convenient access to rail and bus services
- \* convenient access to the CBD with its supporting facilities/services and a growing residential population.

The existing Liverpool Hospital services are provided from a mixture of older buildings (including demountables and rented premises), some newer buildings from the 1990's and more recent buildings (including an extension to emergency and the medical health building). Ongoing increases in the demands for health services, in line with population growth, has resulted in a shortage of medical and surgical beds, ambulatory care areas, and supporting infrastructure (ie operating theatres, procedure rooms etc).

It is proposed that Liverpool Hospital be expanded to meet both the current and projected future demands including:



**LEGEND**



**LOCATION**

**FIG 1**

- \* maintaining its tertiary referral role
- \* increasing its capacity for major trauma work
- \* moving to sub-specialisation in the provision of clinical services.

The Concept Plan for the Liverpool Hospital site envisages a major redevelopment involving new and refurbished facilities to meet the projected catchment requirements for 2016 (with allowance for further development). The envisaged development will involve and provide for the following increases:

	<b>Existing</b>	<b>Future</b>
Hospital beds	591	946
Staff	3,030	4,820
Overnight patients pa	23,151	36,206
Day only patients pa	9,094	15,959
Non-inpatients pa	702,000	1,122,000

*Source: SPP May 2006*

## **1.2 DIRECTOR GENERAL'S REQUIREMENTS**

The Department of Planning letter of 15<sup>th</sup> May 2006 advised of the Director General's Environmental Assessment Requirements. The requirements in relation to Transport and Traffic are reproduced in the following:

*Proposal Description:*

- *Road hierarchy/layout, access and carparking provision.*

*Transport, Traffic and Access:*

- *Strategic transport policy matters*
- *Opportunities to minimise traffic on sensitive road frontages*
- *Efficiency of new roads on the site as well as proposed access, circulation, carparking and drop-off arrangements*
- *Efficiency of Emergency Vehicle access*
- *Proposed access from the wider road network as well as opportunities and constraints of alternative vehicular access points*

- *Measures to promote public transport usage and mode share*
- *Pedestrians and bicycle linkages.*

*An appropriate traffic impact assessment in conjunction with a Traffic Management Plan (TMAP) should be prepared in accordance with RTA Guidelines.*

*Consultation:*

- *Roads and Traffic Authority*
- *Liverpool City Council.*

The purpose of this report is to:

- \* Address the transport and traffic related matters for the project Environmental Assessment
- \* describe the site, the existing hospital development and the operational circumstances
- \* describe the envisaged development under the Concept Plan in the context of the transport and traffic matters
- \* describe the road network serving the site, the prevailing traffic conditions and the public transport services available
- \* provide a Transport Management and Access Plan
- \* assess the suitability of the proposed access and circulation arrangements for vehicles, pedestrians and cyclists
- \* assess the requirements for on-site parking provision
- \* assess the potential traffic implications of the development.

## 1.3 STRATEGIC TRANSPORT POLICY MATTERS

### The Metropolitan Strategy

The metropolitan planning framework for Sydney is currently governed by the recently released Metropolitan Strategy. The Metropolitan Strategy is a strategic document which encompasses a broad framework which is aimed at facilitating and managing growth and development over the next 25 years. The Metropolitan Strategy outlines a vision for Sydney to 2031 and details a range of actions which will be taken to achieve the vision.

The guiding principles of the Metropolitan Strategy are economic, social and environmental sustainability while the 5 main aims of the plan are to enhance liveability, strengthen economic competitiveness, ensure fairness, protect the environment and improve governance. The Metropolitan Strategy is made up of the following 7 key subject areas:

- \* Economy and Employment
- \* Centres and Corridors
- \* Housing
- \* Transport
- \* Environment and Resources
- \* Parks and Public Spaces
- \* Implementation and Governance.

The Metropolitan Strategy not only continues but expands on the 'Centre's Policy' which has been a feature of Sydney's urban planning strategies for a number of decades. The Metropolitan Strategy identifies 27 centres which are categorised into a 4 tier hierarchy. This hierarchy of centres comprises of:

- \* Global Sydney (Sydney and North Sydney)
- \* Regional Cities (Parramatta, Liverpool, Penrith and Gosford)
- \* Specialised Centres
- \* Major Centres.

A key target of the Metropolitan Strategy is for the 27 centres to provide employment for up to 1 million people by 2031 (an overall increase of 236,000 jobs over 2001 levels) of which it is envisaged that Liverpool will accommodate 30,000. This target represents a 93% increase over the 2001 employment level of 15,500. As a nominated 'Regional City' Liverpool will have a full range of business, government, retail, cultural entertainment and recreational facilities and will also be a focal point for regional transport. The Regional Cities will attract new and expanded shopping, health, education, business and cultural facilities. The proposed expansion of the hospital is entirely consistent with these objectives as it:

- \* will provide increased employment opportunities
- \* will be the principle health and medical centre for the expanding south/west region
- \* is conveniently located to the Liverpool bus/rail interchange.

The principle objectives and initiatives outlined in the transport element of the Metropolitan Strategy which are relevant to Liverpool are stated as:

1. Improve transport between Sydney's Centres.
2. Improve the existing transport system by:
  - completing major transport infrastructure projects underway
  - improving reliability and increase capacity of rail services
  - improving the integration of public transport
  - improving operational management of existing transport networks.
3. Influence travel choices to encourage more sustainable travel by:
  - improving local and regional walking and cycling networks
  - implementing a metropolitan parking strategy which builds on the government's existing policy of advocating reduced parking requirements for developments in areas with good public transport
  - implementing Travel Smart voluntary travel behaviour change programs.

4. Improve transport decision making, planning evaluation and funding by improving transport planning through strategic, sub-regional and place planning.

To facilitate access to jobs and services in global and regional cities the metropolitan strategy identifies investment in the expansion of the rail network and strategic bus corridors.

The strategic bus corridors which are proposed to operate either to/from or via Liverpool include:

- \* Liverpool – Parramatta Transitway (operational)
- \* Liverpool – Campbelltown
- \* Liverpool – Bankstown.

Bus priority using both electronic technology and physical infrastructure is to be introduced to the strategic bus corridors to improve reliability and reduce travel time, with a target average bus speed (including stops) of 25 kmph.

The Metropolitan Strategy proposes the introduction of Travel Smart Centres' programs which focus on workplaces and other locations which are major trip generators such as the regional cities of Parramatta, Liverpool and Penrith. The workplace programs are intended to provide practical information and advice to employees, employers and visitors which encourage travel choices that are consistent with and support sustainable travel.

#### State Environmental Planning Policy № 66 (SEPP 66 – Draft)

SEPP 66 (Draft) is a policy package designed to facilitate and drive better integration of landuse and transport planning.

The aim of SEPP 66 is to ensure that urban structure, building forms, land use locations, development designs, subdivision and street layouts help achieve the following planning objectives:

- (a) *improving accessibility to housing, employment and services by walking, cycling, and public transport*
- (b) *improving the choice of transport and reducing dependence solely on cars for travel purposes*
- (c) *moderating growth in the demand for travel and the distances travelled, especially by car*
- (d) *supporting the efficient and viable operation of public transport services*
- (e) *providing for the efficient movement of freight.*

SEPP 66 applies to all Local Government areas located within the Greater Sydney Metropolitan Region (GSMR) and generally relates to development which has a gross floorspace area of more than 1000m<sup>2</sup> and includes, but is not limited to:

- \* community, health and education facilities, such as government services, colleges, universities, libraries and hospitals
- \* parking stations having more than 200 spaces.

Once SEPP 66 is adopted by the State Government all planning and development consent authorities will be required to consider, amongst other things:

- a) whether the carrying out of a particular development furthers the aims and objectives of the Policy
- b) whether the proposed development is consistent with the Policy in terms of location of specific land uses
- c) whether the transport implications have been considered in accordance with Clause 12 of the Policy, and

- d) whether the development or planning instrument incorporates travel demand management mechanisms which minimise the demand for travel and the use of cars, including provisions for:
  - (i) an urban form and structure that encourages walking, cycling and public transport use, and
  - (ii) parking standards that set maximum limits in order to discourage car use in areas with good public transport access,
  - (iii) minimum residential densities that will help to achieve viable public transport services especially in accordance with clause 13 for new residential release areas, and
  - (iv) employment for floorspace densities in commercial or employment areas that reflect the accessibility of the area by suitable public transport services and facilities,

State Environmental Planning Policy No 11 (SEPP 11)

The aims, objectives, policies and strategies of SEPP 11 are to ensure that the Roads and Traffic Authority (RTA):

- a) is made aware of, and
- b) is given the opportunity to make representations in respect to landuse development which are of a particular type and scale and/or have direct vehicular or pedestrian access to an arterial road or from a connecting road which is within 90 metres of an arterial road.

SEPP 11 essentially comprises of 2 schedules which define the scale and type of development and the extent of consultation which is required with the RTA. Based upon the provisions of SEPP 11, it will be necessary for the proposed development to be referred to the RTA's Regional Development Committee for consideration and comment.

Liverpool LEP 1997 and Liverpool City Centre DCP 2003

The planning controls which are relevant to Liverpool Hospital at a local level rests with the Liverpool Local Environmental Plan 1997 and the Liverpool City Centre Development Control Plan 2003. The DCP supplements the provision of the LEP by providing detailed guidance (in the form of objectives and standards including parking) for the development and redevelopment of land within the Liverpool City Centre.

The 5 stated goals of the DCP are:

- \* a 24 hour CBD employing a daily workforce of at least 30,000 persons by 2021
- \* a CBD that is both legible and accessible, with significantly increased densities so as to promote high quality residential, commercial and mixed use precincts
- \* a retention and maintenance of the fundamental CBD design components including enhanced heritage elements, an active retail openness and a high visual quality in the public domain
- \* public transport priority with a pedestrian focus occurring within the core area and short term parking provisions along the Ring Road system
- \* initiatives that will provide economic incentives for development in the CBD.

Whilst compliance with the prescribed standards of the DCP will generally indicate achievement of the goals and objectives of the DCP, there is scope within DCP which enables Council to be flexible in the assessment of development which do not strictly comply with a particular standard on the proviso that it is clearly demonstrated that the relevant objectives have been satisfied.

## 2. EXISTING DEVELOPMENT

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### 2.1 SITE AND CONTEXT

The Hospital site (Figure 2) is a large irregular shaped land holding occupying a total area of some 15 ha which spans the Southern Railway Line. The principal western sector of the site is bounded to the west by Goulburn Street together with sections of Elizabeth Street and Campbell Street. The eastern sector is bounded to the south by Georges River and has a road connection to Scrivener Street while the sectors are connected by a 'private road' level crossing of the railway line.

The site is adjoined to the north by the large Liverpool Boys and Girls High School complexes and to the south by a TAFE College and Bigge Park. The railway corridor which separates the western and eastern sectors is sufficiently wide to accommodate for the planned future expansion of the railway lines. The site is located approximately midway between Liverpool Railway Station (600 metres) and Warwick Farm Railway Station (700 metres).

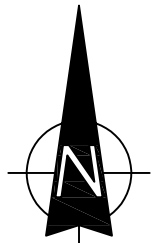
Immediately to the west and north-west are a private hospital and a number of medical centres, within a precinct largely comprised of residential flats buildings, while Liverpool CBD which extends to the south-west. Medium density residential development also extends immediately to the north-west and to the north while the eastern sector of the hospital is adjoined by industrial lands.

### 2.2 EXISTING DEVELOPMENT

The existing development at Liverpool Hospital, which is depicted on the diagram overleaf, is largely contained to the western sector with the eastern sector comprising non-clinical facilities including ISD, area administration, staff amenities, child care centre and energy plant together with numerous open areas of carparking



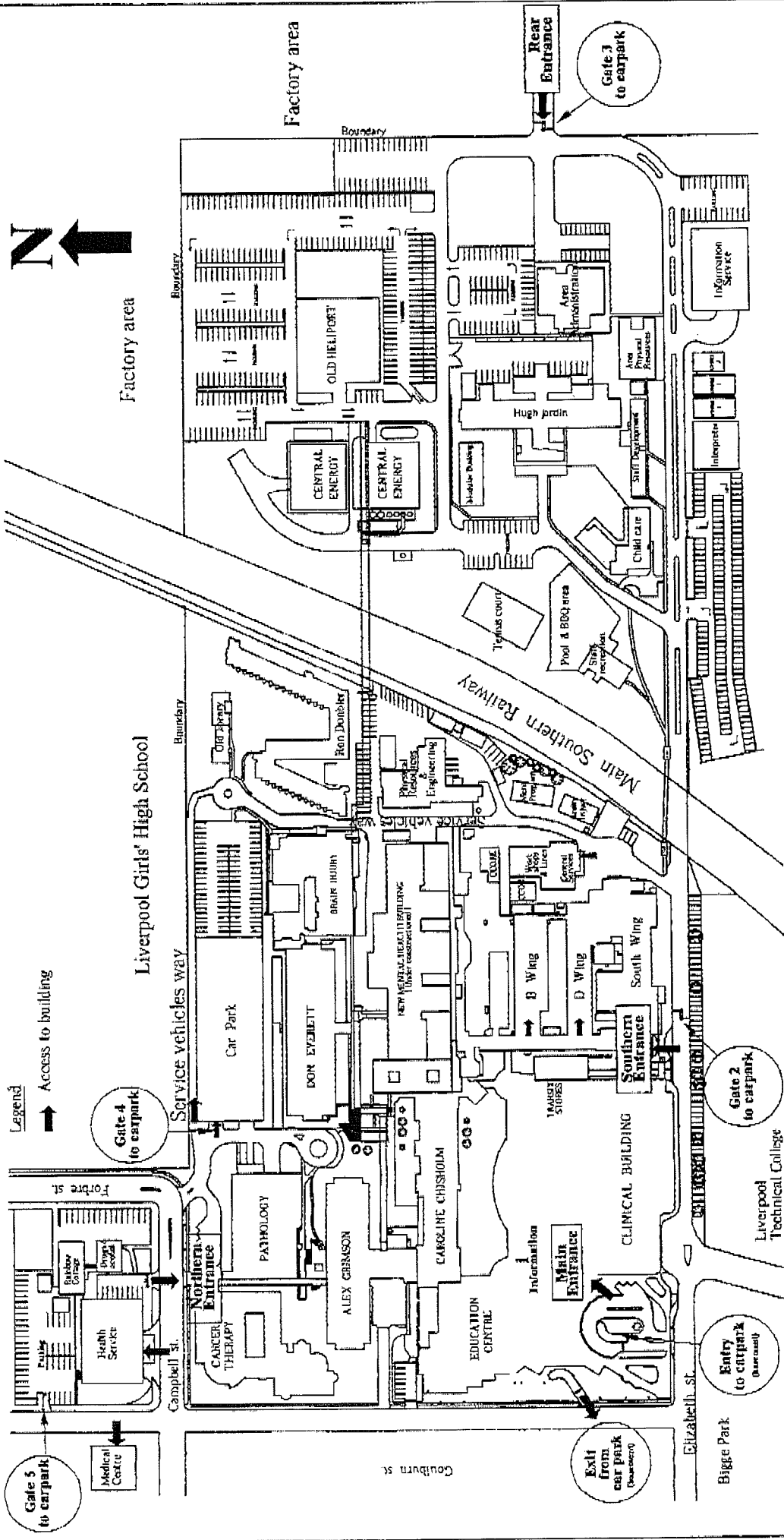
**LEGEND**



**HOSPITAL  
SITE**

**FIG 2**

# LIVERPOOL HOSPITAL MAP



Legend  
 → Access to building

	L.I.H.S. - Liverpool Hospital Site - EXCLUDING Surroundings Scale: 1:1000 Date: 1/11/88
L.I.H.S. - Liverpool Hospital Site - EXCLUDING Surroundings Scale: 1:1000 Date: 1/11/88	L.I.H.S. - Liverpool Hospital Site - EXCLUDING Surroundings Scale: 1:1000 Date: 1/11/88

for staff. The clinical services located within the western section, are contained in a mixture of older and more recent buildings.

The main (public) entry to the hospital is located in the south-western corner of the site (at the Elizabeth Street/Goulburn Street/College Street intersection) and the hospital is the major tertiary referral hospital for the south-west of SSWAHS and as well as clinical care it provides for teaching and research.

There are some 607 beds provided in the hospital and there are some 5,000 persons employed (equivalent to some 3,030 full time employees) comprising:

	<b>Employees 2005</b>
Nursing	2,104
Medical	526
Allied and Complementary Health	364
Other	2,007
<b>Total</b>	<b>5,001</b>

### **2.3 OPERATIONAL CIRCUMSTANCES**

The catchment area for Liverpool Hospital comprises the south-west part of SSWAHS and over 90% of the services provided at the Hospital are for residents of the south-west. The locational make up of the patients which attend the Hospital in 2003/4 were as follows:

Liverpool	38%
Fairfield	30%
Campbelltown	14%
Bankstown	13%
Camden	3%
Wollondilly	1%
Wingecarribee	1%

Questionnaire surveys have revealed the following travel mode circumstances in relation to movements to/from the Hospital:

<b>Travel Mode</b>	<b>Staff</b>	<b>Day Patient</b>	<b>Patient Visitor</b>
Car driver	80%	58%	50%
Car passenger	5%	19%	20%
Set-down/pick-up, taxi	1.5%	2%	1.5%
Train	8%	9%	20%
Bus	2.5%	7%	7%
Walk/cycle	3%	5%	1.5%

The morning 'arrival time' patterns for staff, day patients and patient visitors are depicted on the graph overleaf and it is apparent that the only significant activity during the normal 'on-street' peak traffic periods is that of the staff arrivals and departures which peak at 8.00am and 4.30pm respectively.

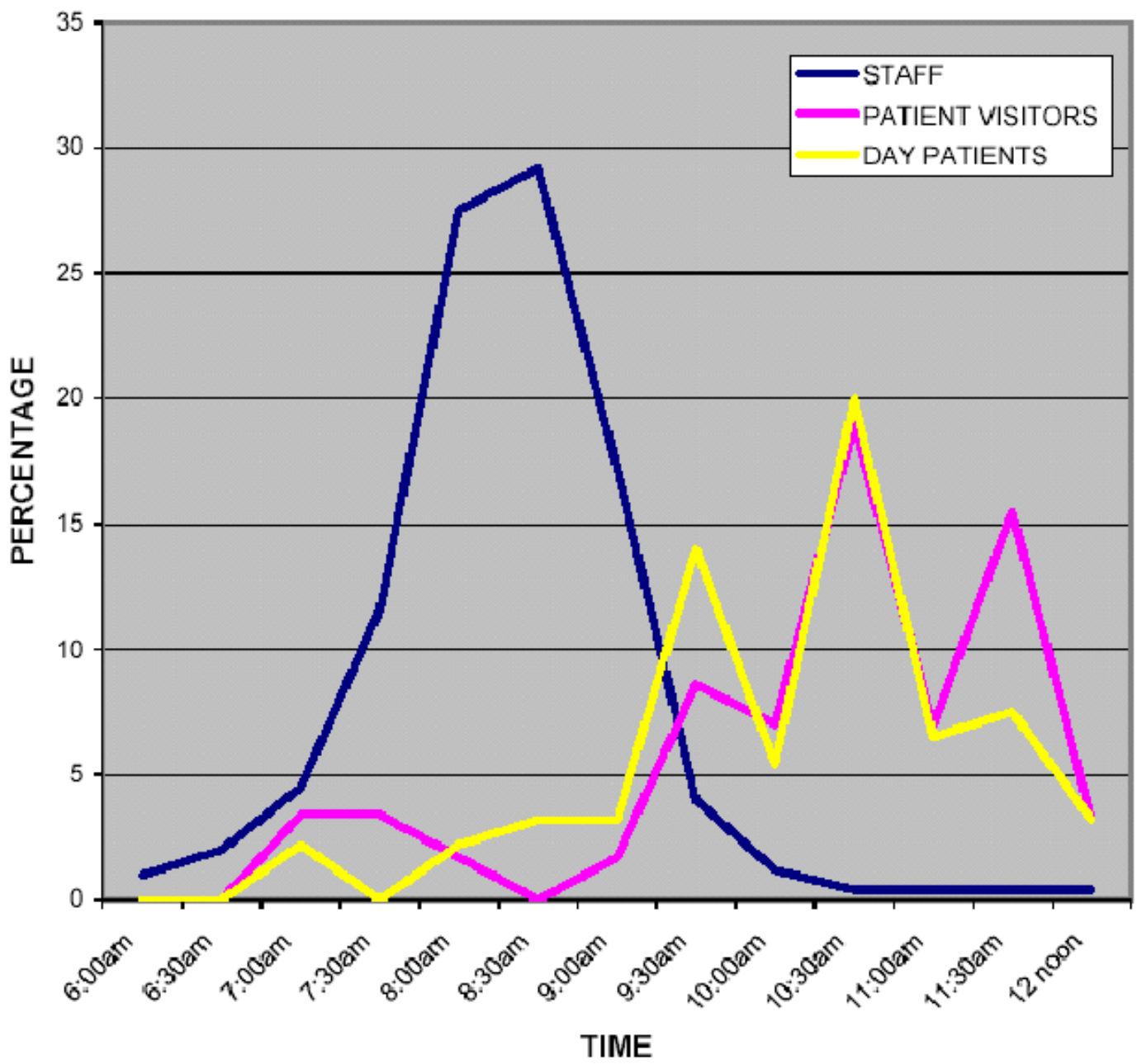
The locational make-up of 'place of residence' of existing staff, day/out patients and visitors is as follows:

	<b>Staff</b>	<b>Day/Out Patients</b>	<b>Visitors</b>
North	10%	5%	15%
North-west	9%	5%	28%
North-east	17%	37%	7%
East	12%	5%	11%
West	4%	2%	10%
South-west	19%	20%	15%
South-east	13%	5%	2%
South	14%	9%	11%
Liverpool	2%	14%	1%

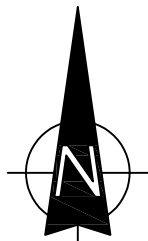
Whilst the hospital specifically serves the South-West Metropolitan area it is apparent that a significant proportion of movements to/from the hospital (at the present time) are distributed to/from the North, North-West, North East and East as follows:

Staff	-	46%
Day/Out Patients	-	52%
Visitors	-	61%

This pattern is likely to change to some extent over time as urban development extends in the south-western sector. The seasonal pattern of hospital admissions is fairly consistent as shown on the graph overleaf.



**LEGEND**

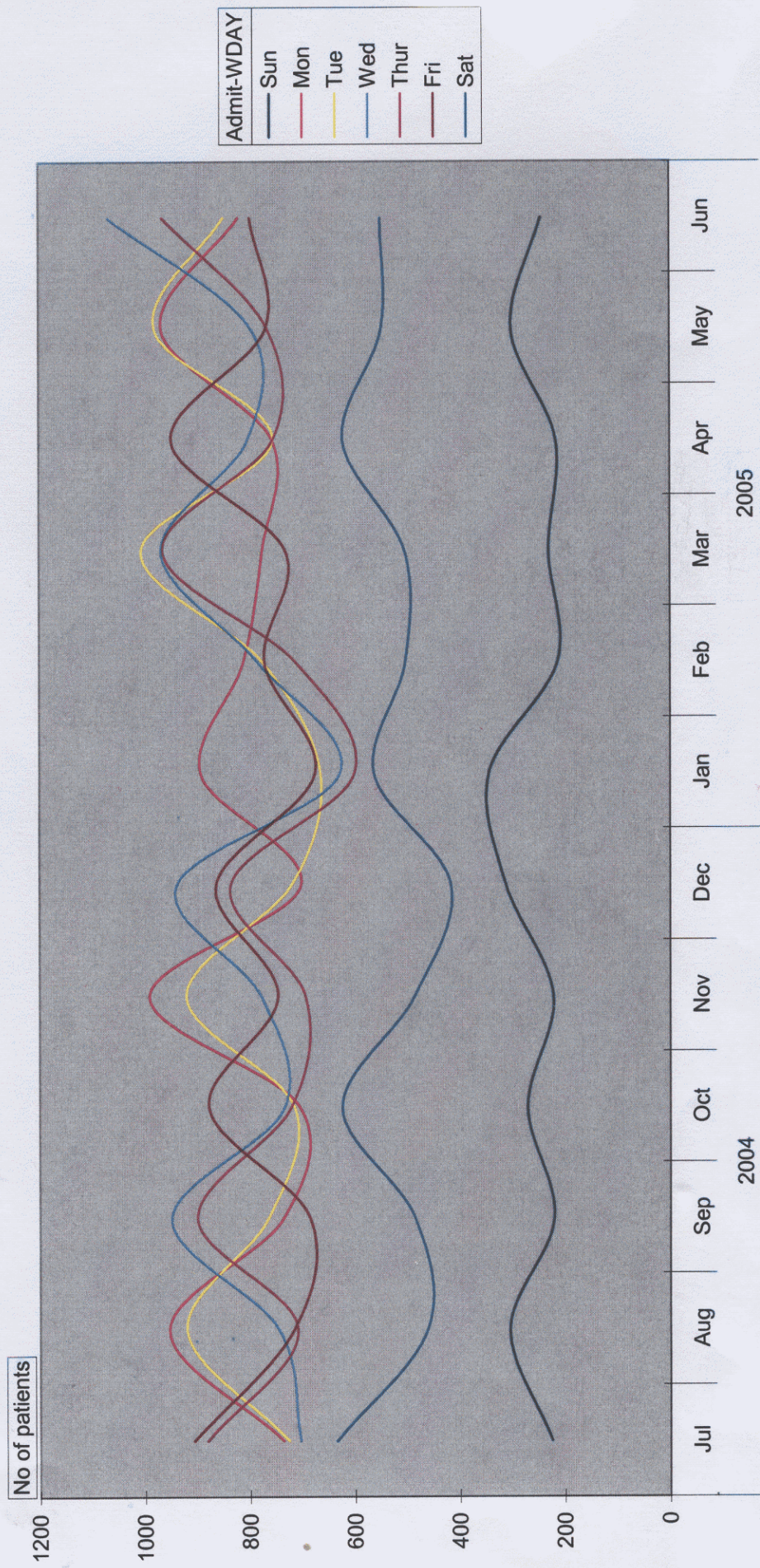


**HOSPITAL ARRIVAL PATTERNS**

Chart7

### Seasonal variations in admissions FY0405

HOUR (All)



Years Admit month

The following vehicle movements were recorded at the various hospital access points during the weekday morning and afternoon peak periods.

	AM (8-9)		PM (4.30-5.30)	
	IN	OUT	IN	OUT
Elizabeth Street Access	209	67	25	165
Campbell Street Access	226	21	40	186
Scrivener Street Access	42	2	4	27
Southern Access	72	34	66	72
<b>Total</b>	<b>549</b>	<b>124</b>	<b>135</b>	<b>450</b>
Vehicles over level crossing	185 (EB)	18 (WB)	12 (EB)	154 (WB)
Pedestrians over level crossing	173 (WB)	44 (EB)	29 (WB)	173 (EB)

There are a number of smaller carparking areas associated with the hospital and there is a significant usage of available on-street parking (estimated hospital usage of some 160 spaces). The estimated total traffic generation of the hospital during the morning and afternoon 'on-street' peak periods is as follows:

	AM	PM
IN	650	200
OUT	150	550
<b>Total</b>	<b>800 vtp</b>	<b>750 vtp</b>

There is currently a total of 1,506 parking spaces provided on-site (including 21 spaces at the separate Health Services Building). There are some 600 to 700 in the eastern sector (No varies with source) and some 850 in the western sector. The approximate allocation/usage of the spaces is as follows:

Visitors/patients	Clinical Building	123
	Campbell Street	150
Staff	Campbell Street	440
	Eastern Sector	570
VMO's	Clinical Building	20
AHS	Eastern Campus	90

Source: Metro Parking Management

The normal pattern of utilisation of the available parking spaces is shown on the Metro Parking schedule for Wednesday 15<sup>th</sup> March 2006 reproduced overleaf.

The assessed capacity and estimated usage of on-street parking by hospital staff, patients and visitors is as follows:

	Capacity	Spaces Occupied @		
		9.00am	12 noon	3.00pm
Goulburn Street	96	94 (37)	89 (38)	89 (39)
Campbell/Forbes Streets	55	48 (24)	55 (28)	39 (20)
Elizabeth Street	42	33 (26)	36 (27)	34 (27)
College Street	83	74 (22)	73 (28)	74 (22)
Goulburn Street	52	28 (28)	26 (26)	26 (26)
Hart Street etc	104+	104+ (23)	104+ (30)	104+ (26)
<b>Total</b>	<b>329</b>	<b>277 (160)</b>	<b>279 (177)</b>	<b>262 (160)</b>

\* ( ) Hospital use

**Patronage**

The figures provided in the table below are for Wednesday 15 March, 2006. The table below shows patronage at each hour for the 24 hours that day.

PARKING ANALYSIS													
	Campbell Street				Clinical Building				Eastern Campus		Health Services		GRAND TOTAL
	Staff Passes	Staff 5 day	Casuals	Cas 5 day	Staff Passes	Casuals	TOTAL	Staff Passes	5 day	TOTAL	Staff Passes	TOTAL	
0:00	10	20	5	1	13	4	17	20	20	20	0	73	
1:00	7	17	5	1	13	4	17	17	17	17	0	64	
2:00	7	17	6	3	13	4	17	17	15	32	0	82	
3:00	8	17	6	3	13	4	17	17	15	32	0	83	
4:00	8	17	6	3	13	4	17	17	15	32	0	83	
5:00	10	17	6	3	13	4	17	18	15	33	0	86	
6:00	21	17	7	3	13	4	17	24	15	39	0	104	
7:00	63	19	10	3	13	4	17	90	26	116	11	239	
8:00	146	47	20	2	4	11	15	254	36	290	18	538	
9:00	247	106	49	3	12	59	71	411	52	463	24	963	
10:00	283	110	114	3	13	125	138	449	62	511	22	1181	
11:00	287	109	145	5	17	122	139	449	63	512	22	1219	
12:00	302	109	142	6	20	125	145	457	65	522	22	1248	
13:00	304	121	138	6	22	128	150	489	76	565	23	1307	
14:00	308	131	135	5	19	122	141	488	75	563	23	1306	
15:00	307	126	99	5	19	112	131	485	73	558	22	1248	
16:00	261	100	83	3	18	102	120	439	67	506	14	1087	
17:00	180	76	38	4	18	83	101	314	42	356	14	769	
18:00	91	50	33	3	12	81	93	150	29	179	3	452	
19:00	69	40	41	3	2	86	88	104	22	126	2	369	
20:00	57	31	35	3	1	94	95	89	16	105	0	326	
21:00	44	30	16	2	0	13	13	82	15	97	0	202	
22:00	37	24	9	1	14	1	15	67	12	79	0	165	
23:00	11	5	5	1	14	1	15	34	7	41	0	78	
0:00	11	3	5	1	14	1	15	14	6	20	0	55	

### 3. PROPOSED DEVELOPMENT

---

#### 3.1 CONCEPT PLAN

The concept plan for redevelopment of the hospital is reproduced overleaf and principal features of the scheme are:

- \* new multi-level clinical services buildings extending east and north from the existing main hospital building
- \* improved access and permeability with additional entry points main pedestrian mall link improved circulation system
- \* new multi-deck carpark on the east campus accessed by vehicle and pedestrian over rail bridges
- \* new north link road providing significantly improved access and relieving hospital generated traffic congestion.

#### 3.2 PROJECTED OPERATIONAL CIRCUMSTANCES

The projected future needs of the upgraded hospital have been identified and the key service demand 'drivers' for the further development of Liverpool Hospital include:

##### Population Growth:

By 2016, the population in SSWAHS is expected to increase by approximately 18% to 1.52 million, maintaining its position as the most populous Area Health Service in NSW. Liverpool Hospital provides for the tertiary needs for western zone residents (840,000 people) in addition to providing for its own Liverpool LGA which is one of the fastest growing areas in Australia. By 2016, almost 1 million people will reside in



the western zone. The majority of the growth implications from the south west land release ('Bringelly') will occur post 2016.

Intensification of Growth:

An estimated 4.2% yearly growth in the demand for acute inpatient services and 5.3% for day only separations. It is expected that ambulatory services would grow in the order of 5% annually. The increasing demand for ambulatory services reflect changing models of care and technological innovation.

Aging Population:

Increased critical care needs and demand for subacute services will occur as a result of aged people demonstrating an increasing frequency of degenerative conditions.

Physical Capacity:

The current catchment population's demand for acute, subacute and ambulatory services has outstripped the physical capacity of Liverpool Hospital to provide any enhanced service provision for the population.

Current planning to provide for the projected 2016 demands (and existing shortfall) indicates that the hospital development will need to increase service provisions as follows:

Beds	-	Existing	591	
		Future	946 (+ 60%)	
Staff (fte)	-	Existing	3,030	
		Future	4,820 (+ 59.1%)	
Servicing	-		Existing	Future
Acute overnight separations			23,151	36,206 (+ 56.4%)
Acute day only separations			9,094	15,959 (+ 75.5%)
Non-patient occasions of service			702,000	1,122,000 (+ 59.8%)

The traffic generation implications are assessed in Section 6.

### 3.3 LIVERPOOL CBD DEVELOPMENT

A number of studies have been undertaken to guide the future development of Liverpool CBD both for the medium and longer term. Council is currently undertaking a review of DCP № 3 – City Centre Development and it is envisaged that by 2021 the CBD will develop to accommodate:

- \* a workforce of 30,000 persons
- \* a residential population of 24,000 persons.

The potential traffic implications of this envisaged growth is substantial and Council initiated a study to assess and develop a strategy which would provide for a sustainable outcome. Issues identified in the study included:

- \* Existing Journey to Work Travel Mode for Liverpool CBD by car – 80.2%
- \* Comparative Journey to Work Travel Mode (eg Chatswood) by car – 58%
- \* Conceptual development outcome for 2021 (ie additional floorspace/units):

Commercial	248,000m <sup>2</sup>
Retail	89,000m <sup>2</sup>
Residential apartments	6,500
- \* Additional Traffic Generation (unless constrained)

AM	6,255 vtp
PM	8,060 vtp

In order to overcome this traffic consequence it was recommended in the report to Council that:

- \* the permitted rate for provision of carparking for commercial and retail floorspace be constrained (from 1 per 35m<sup>2</sup> to 1 per 50 – 100m<sup>2</sup>)
- \* a proportion of the permitted parking for retail and commercial floorspace be located 'off-site' (re contributions) in order to:
  - reduce traffic within the CBD core
  - reduce access movements across footways within the CBD core
  - provide 'managed' consolidated public parking with access to the ring road.

The study undertaken in December 2002 did not envisage the current proposal to significantly expand the hospital.

Council has also undertaken a number of 'visionary' assessments of the potential to extend the CBD easterly across the Georges River. There are no explicit concepts in relation to this potential long term outcome and 'flooding' presents a significant challenge to overcome.

## 4. ROAD NETWORK AND TRAFFIC CONDITIONS

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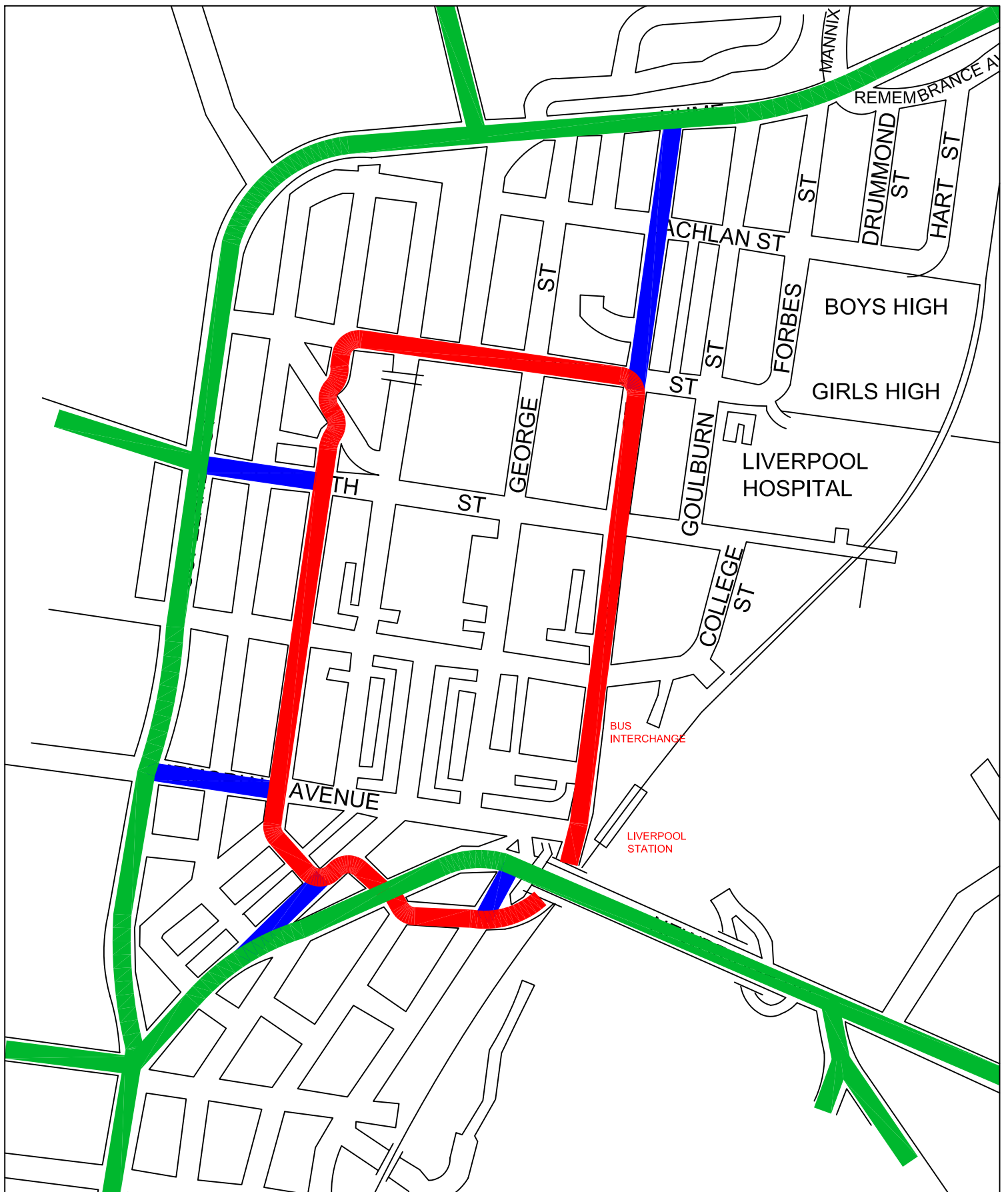
### 4.1 ROAD NETWORK

The road network serving Liverpool CBD (Figure 3) comprises:

- \* *Hume Highway* – a State Highway and arterial route which runs along the western and northern sides of Liverpool CBD
- \* *Cumberland Highway* – a State Highway and arterial route which connects northwards from the Hume Highway linking to the M4 and the F3
- \* *Elizabeth Drive* – a State Road and arterial route which connects westwards from Liverpool CBD to The Northern Road
- \* *Newbridge Road* – a State Road and arterial route connecting easterly from the Hume Highway
- \* *Hoxton Park Road* – a State Road and arterial route connecting westerly from Hume Highway to Cowpasture Road
- \* *Liverpool CBD Ring Road* along Bigge Street, Campbell Street and Bathurst Street with connections to the surrounding arterial routes.

Further afield, the principal routes providing access for Liverpool CBD include:

- \* *M5 Motorway* which connects to Hume Highway
- \* *Heathcote Road* which connects to Princes Highway
- \* *Moorebank Avenue* which connects to M5
- \* *Governor Macquarie Drive* which connects between Hume Highway and Newbridge Road



**LEGEND**

-  ARTERIAL
-  RING ROAD
-  CONNECTIONS



**ROAD NETWORK**

**FIG 3**

- \* *M7 Westlink* which provides a cross regional route connecting with Hume Highway and Elizabeth Drive.

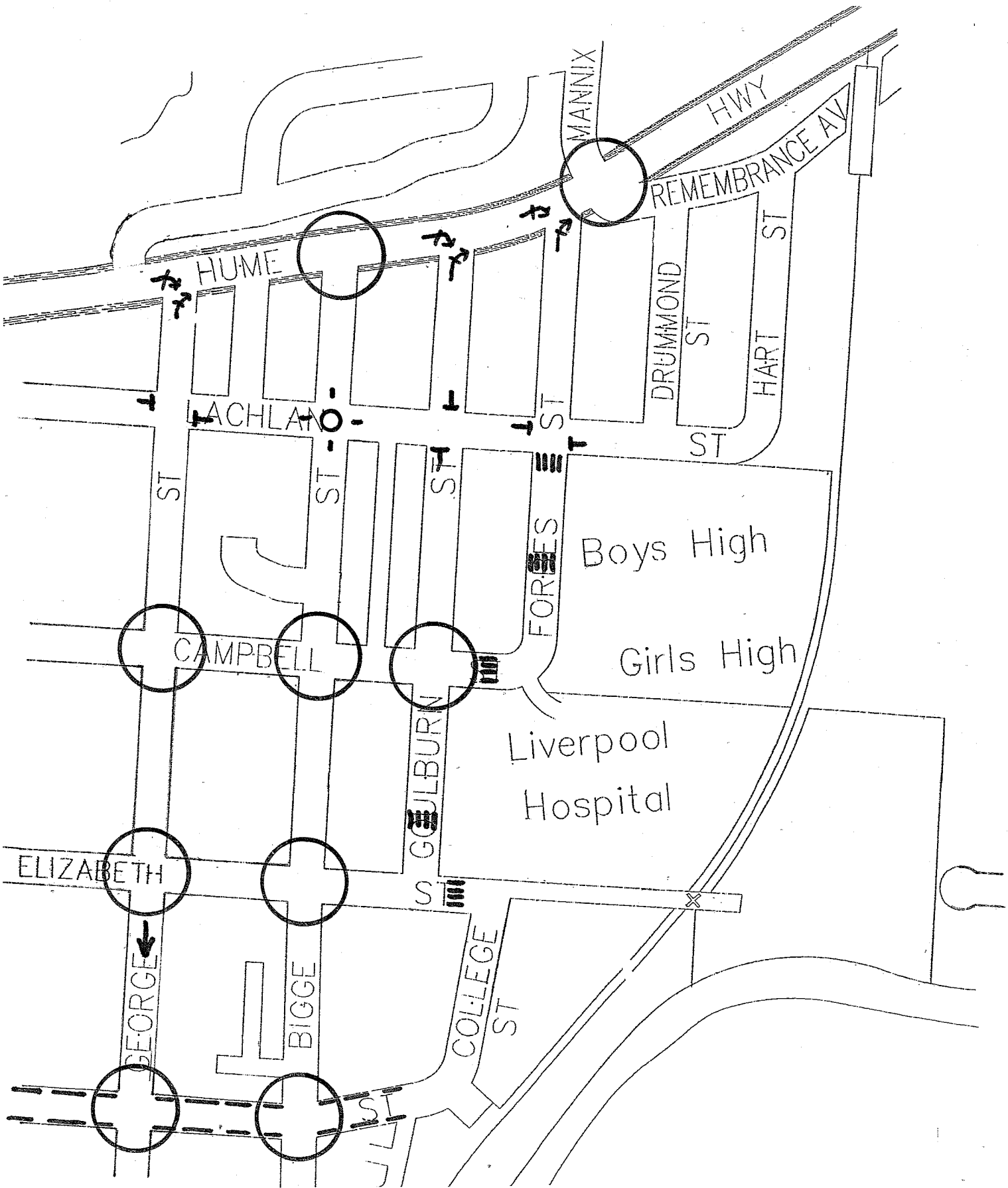
The Railway Line and Georges River present significant barriers to the road system along the eastern side of Liverpool CBD.

## **4.2 TRAFFIC CONTROLS**






The existing traffic controls which have been applied to the roads in the vicinity of the Liverpool Hospital site (Figure 4) include:

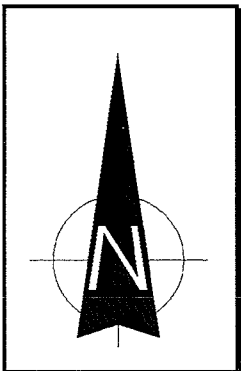
- \* the traffic signals along the Hume Highway at the Bigge Street, Remembrance Avenue/Mannix Parade and Governor Macquarie Drive intersections
- \* the traffic signals along Bigge Street at the Campbell Street, Elizabeth Street and Moore Street intersections
- \* the traffic signals at the Campbell Street and Goulburn Street intersection
- \* the STOP sign controls at intersections along Lachlan Street
- \* the roundabout at the Bigge Street and Lachlan Street intersection
- \* the marked footcrossings across Campbell Street, Forbes Street, Goulburn Street and Elizabeth Street
- \* the prohibited right-turn movements on the Hume Highway at the Forbes Street and Goulburn Street intersections
- \* the BUS LANE provisions along Moore Street.

The existing public parking provisions on and off-street in the vicinity of the Liverpool Hospital site are shown in Figures 5a and 5b.



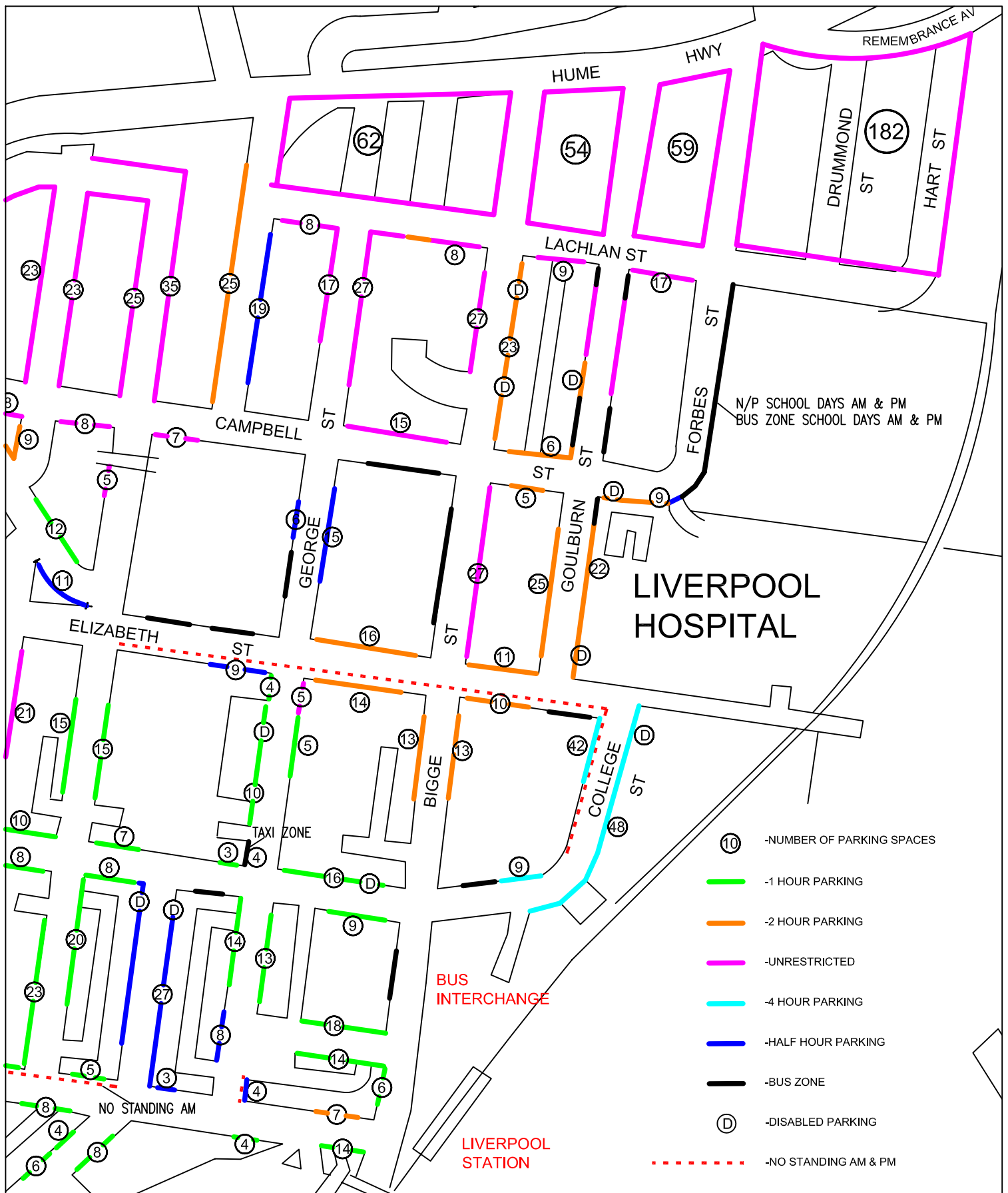
**LEGEND**

-  TRAFFIC SIGNALS
-  NO RIGHT TURN
-  STOP SIGN
-  ROUNDABOUT
-  MARKED FOOTCROSSING

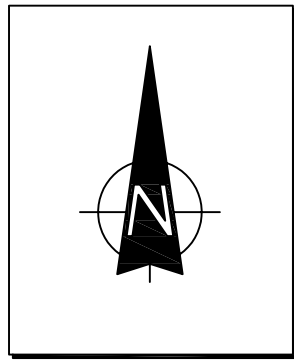


**TRAFFIC  
CONTROLS**

**FIG 4**

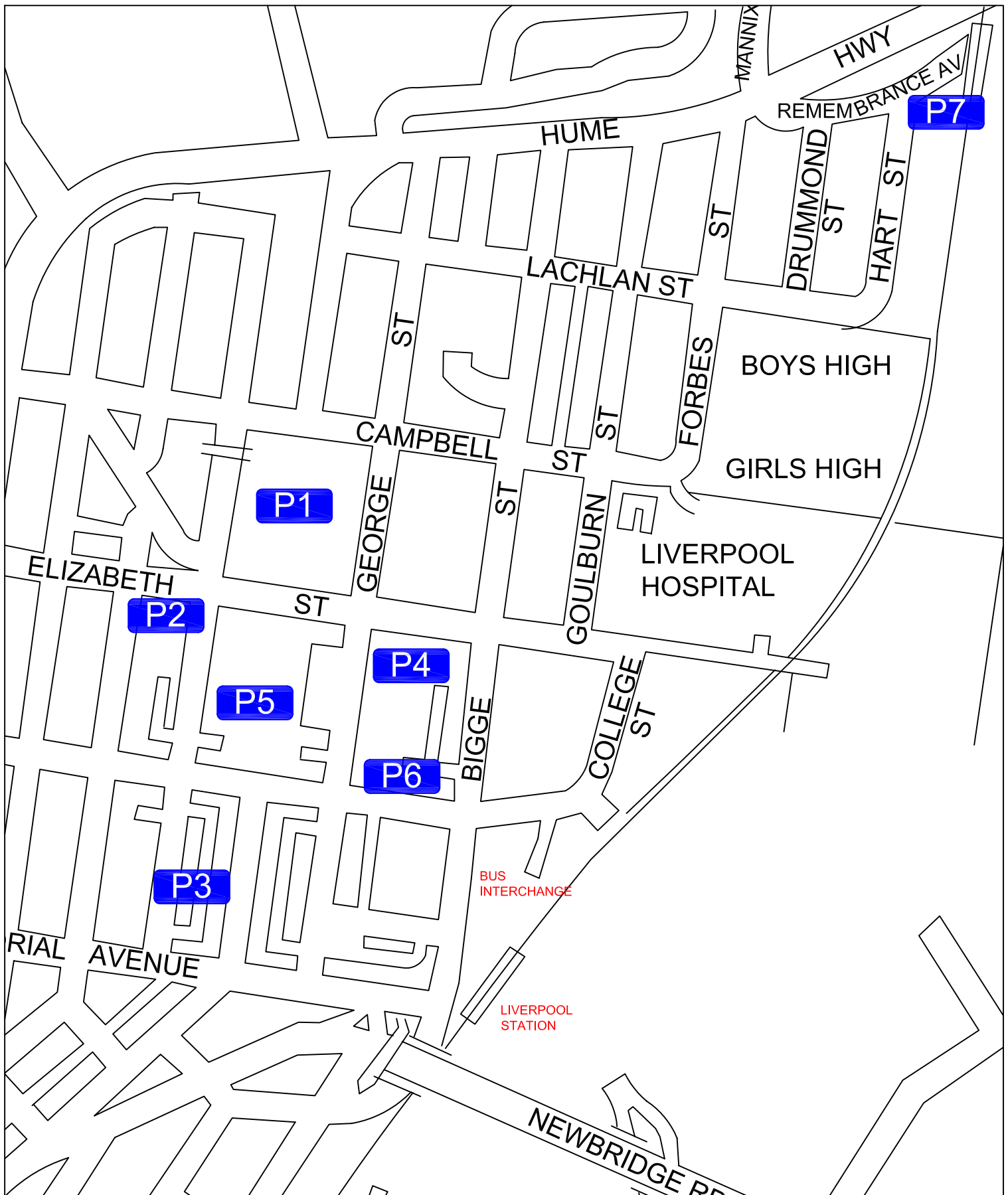


**LEGEND**



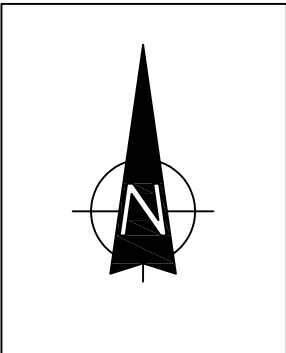
**ON-STREET PARKING RESTRICTIONS**

**FIG 5A**



**LEGEND**

<b>P1</b>	WESTFIELD 2 700	<b>P5</b>	LIVERPOOL PLAZA 250
<b>P2</b>	BATHURST STREET 240	<b>P6</b>	MOORE STREET 250
<b>P3</b>	NORTHUMBERLAND ST 440	<b>P7</b>	WARWICK FARM STATION 328
<b>P4</b>	WARREN SERVICEWAY 670		



**OFF-STREET PUBLIC  
PARKING**

**FIG 5B**

### 4.3 TRAFFIC CONDITIONS

An indication of the existing traffic conditions in the vicinity of the site is provided by data<sup>1</sup> published by the Roads and Traffic Authority and traffic surveys undertaken for this study. The traffic data published by the RTA is expressed in terms of Annual Average Daily Traffic (AADT) and the results of the latest recorded data are indicated in the following:

	AADT	
	1999	2002
Hume Highway at Bigge Street	46,203	42,200
Hume Highway at Campbell Street	67,894	63,286
Hume Highway at Warwick Farm	48,555	46,480

The significant recorded reduction in volumes on the Highway reflect the completion of the M5 route while the further impact of the opening of the M7 route is yet to be established.

The results of traffic counts undertaken at intersections in the vicinity of the hospital site during the morning and afternoon peak periods are shown in Figure 6a and 6b.

The operational performance of intersections in the area has been analysed using the SCATES and SIDRA programs. The results of that analysis for the morning and afternoon peak periods is provided in the following indicating a generally satisfactory outcome. The criteria for interpreting these results is provided overleaf.

	AM			PM		
	LOS	DS	AVD	LOS	DS	AVD
Hume/Highway/Bigge Street	A	0.70	18.0	B	0.73	23.4
Hume Highway/Remembrance Ave	A	0.82	6.9	A	0.80	12.5

<sup>1</sup> Traffic Volume Data for Sydney Region  
Roads and Traffic Authority

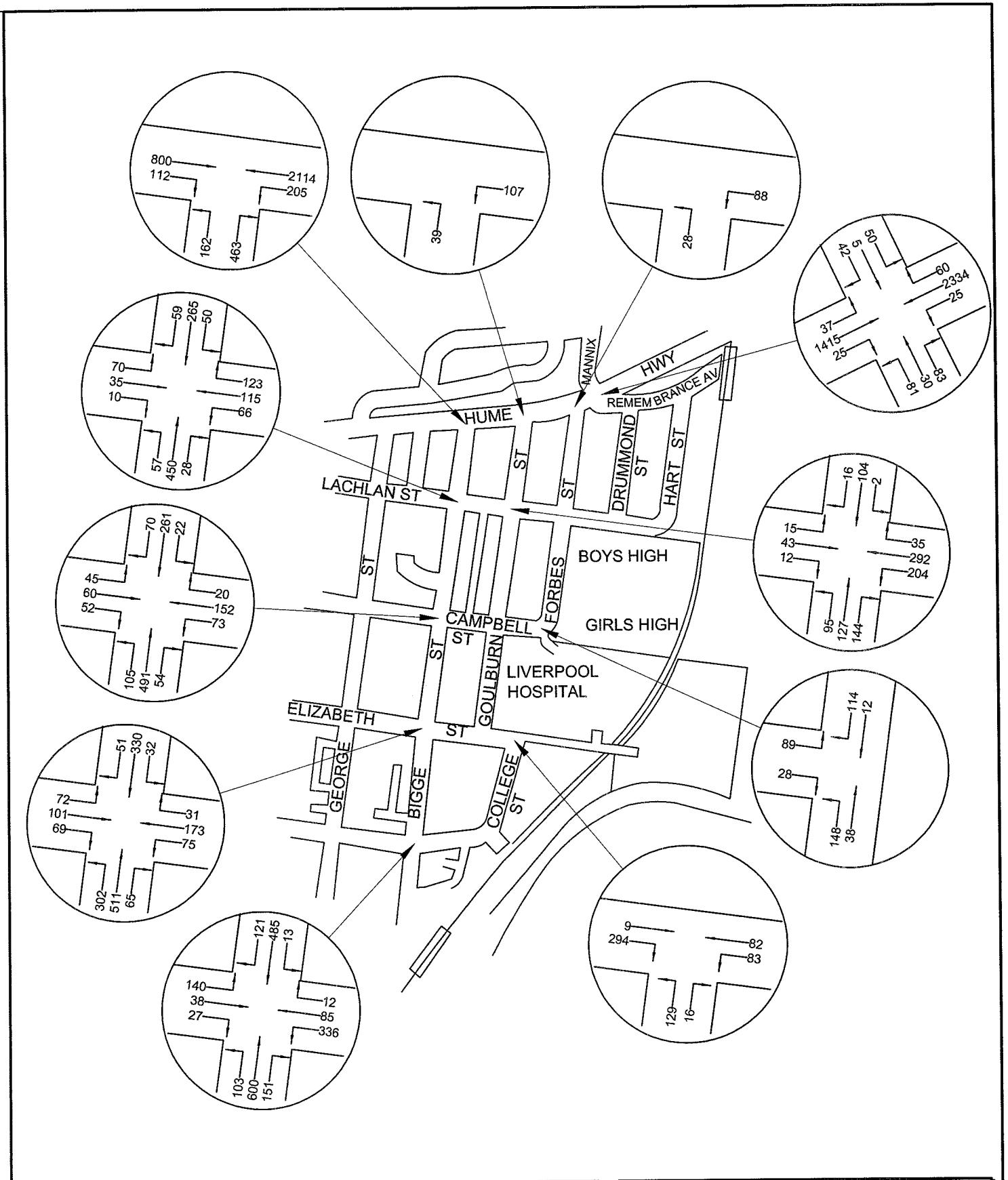
	AM			PM		
	LOS	DS	AVD	LOS	DS	AVD
Bigge Street/Lachlan Street (RAB)	A	0.45	8.8	A	0.53	9.4
Bigge Street/Campbell Street	B	0.59	19.5	B	0.36	16.4
Elizabeth Street/Bigge Street	B	0.71	16.8	B	0.57	15.6

*LOS – Level of Service*  
*DS – Degree of Saturation*  
*AVD – Average Vehicle Delay*

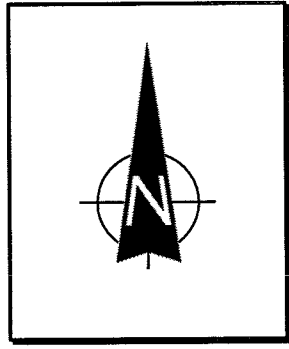
#### 4.4 FUTURE CIRCUMSTANCES

With the recent completion of the Westlink M7 Motorway there are no significant programmed or proposed schemes to upgrade the road system serving Liverpool CBD. Adjustments have been undertaken to the southern section of the CBD ring road in recent years and it is apparent that the envisaged development of the hospital needs to be considered largely in the light of the road system at it exists at the present time.

In relation to the envisaged future extension of the CBD to the eastern side of the river the potential vehicle and pedestrian connections (to the existing road system) remain purely notional at this time.

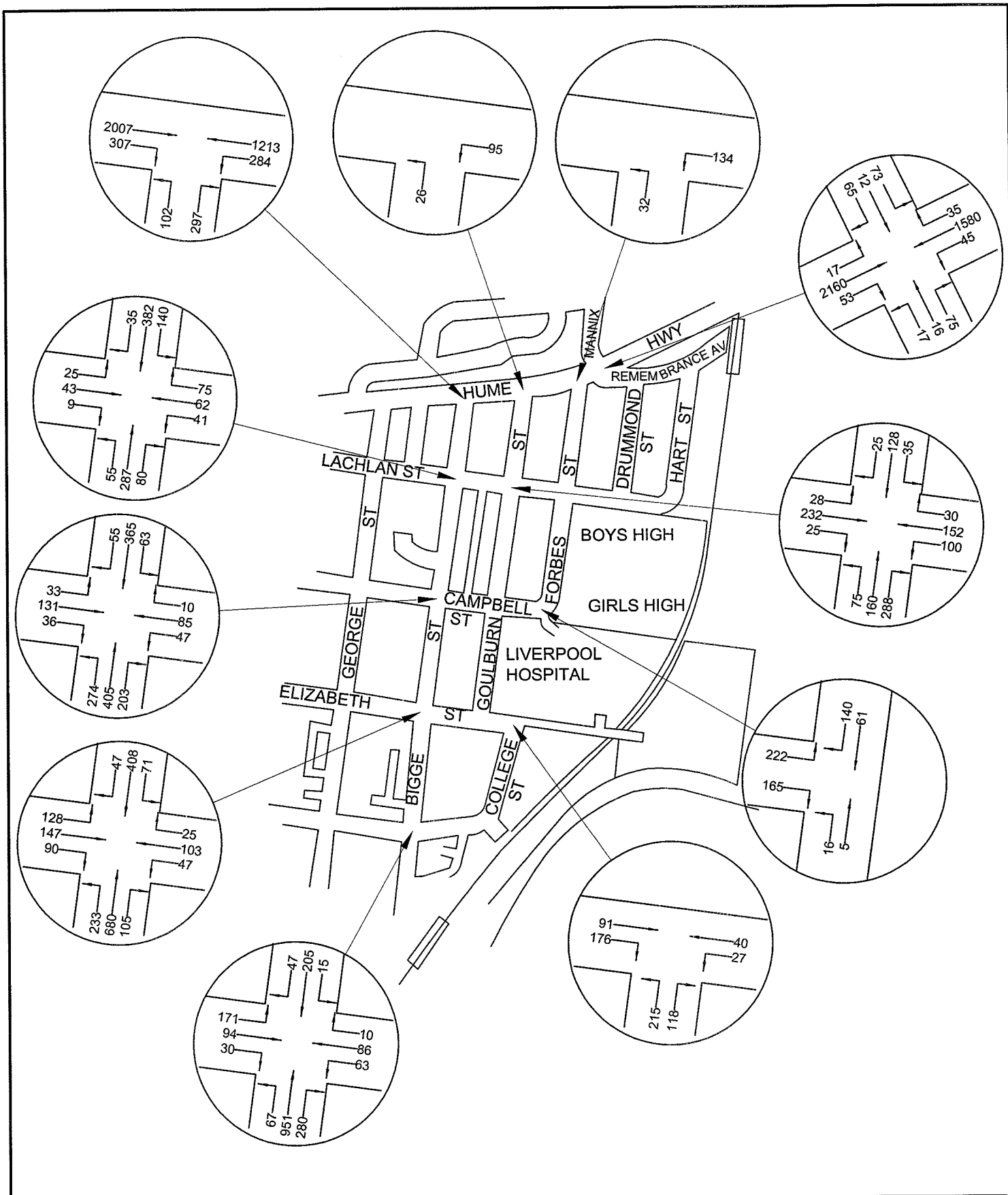


**LEGEND**



**AFTERNOON PEAK  
TRAFFIC VOLUMES**

**FIG 6B**



**LEGEND**



**MORNING PEAK  
TRAFFIC VOLUMES**

**FIG 6A**

# Criteria for Interpreting Results of SCATES and SIDRA Analyses

## 1. Level of Service (LOS)

LOS	Traffic Signals and Roundabouts	Give Way and Stop Signs
'A'	Good	Good
'B'	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
'C'	Satisfactory	Satisfactory but accident study required
'D'	Operating near capacity	Near capacity and Accident Study required
'E'	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode	At capacity and requires other control mode
'F'	Unsatisfactory and requires additional capacity	Unsatisfactory and requires other control mode

## 2. Average Vehicle Delay (AVD)

The AVD provides a measure of the operational performance of an intersection as indicated on the table below which relates AVD to LOS. The AVD's listed in the table should be taken as a guide only as longer delays could be tolerated in some locations (ie inner city conditions) and on some roads (ie minor side street intersecting with a major arterial route).

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabouts	Give Way and Stop Signs
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode	At capacity and requires other control mode

## 3. Degree of Saturation (DS)

The DS is another measure of the operational performance of individual intersections.

For intersections controlled by **traffic signals**<sup>2</sup> both queue length and delay increase rapidly as DS approaches 1, and it is usual to attempt to keep DS to less than 0.9. Values of DS in the order of 0.7 generally represent satisfactory intersection operation. When DS exceeds 0.9 queues can be anticipated.

For intersections controlled by a **roundabout or GIVE WAY or STOP signs**, satisfactory intersection operation is indicated by a DS of 0.8 or less.

<sup>1</sup> the values of DS for intersections under traffic signal control are only valid for cycle length of 120 secs

## 5. PUBLIC TRANSPORT SERVICES

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Access by public transport to and from the Liverpool CBD and the hospital is primarily provided by rail services operated by CityRail supplemented by an extensive network of privately operated bus services.

### 5.1 RAIL

Two railway stations (Liverpool and Warwick Farm) are located on the eastern fringe of the Liverpool CBD providing the majority of residents and workers with convenient access to the CityRail network.

In early 2000, Liverpool Station was substantially upgraded and supplemented with the construction of a major bus interchange on the western side of the station. The bus interchange provides 12 separate bus stands of which 3 are designated for 'set-down' activities. Access to/from each island platform and the station concourse is designed to facilitate the movement of mobility impaired persons with the provision of available by lifts and escalators.

Whilst Liverpool Station functions as a focal point in the region for bus/rail interchange, Warwick Farm Station (to the north of Liverpool Station) has been developed as a park'n'ride facility with parking provision for some 340 vehicles (supplemented by other on-street parking in the vicinity).

'Journey to Work' data indicates that just under 10% of workers in the Liverpool CBD utilise the rail network on a regular basis. Data provided by CityRail and reproduced in Table 5.1 overleaf indicates that some 17,600 and 3,900 persons either board or alight trains each weekday at Liverpool and Warwick Farm Stations respectively.

**TABLE 5.1 CITYRAIL SERVICES – WEEKDAY PATRONAGE**

Station		Time Period				
		2-6am	6-9.30am	9.30am-3pm	3-6.30pm	6.30pm-2am
Liverpool	(IN)	160	2,940	2,450	2,680	530
	(OUT)	80	2,170	2,270	2,960	1,280
Warwick Farm	(IN)	40	1,110	420	320	20
	(OUT)	20	260	370	960	340

Both Liverpool and Warwick Farm Stations are serviced by CityRail's Cumberland, Inner West, Bankstown and Southern Lines providing users with non-transfer connections with major centres such as Sydney CBD, Parramatta, Fairfield, Blacktown, Strathfield, Bankstown and Campbelltown.

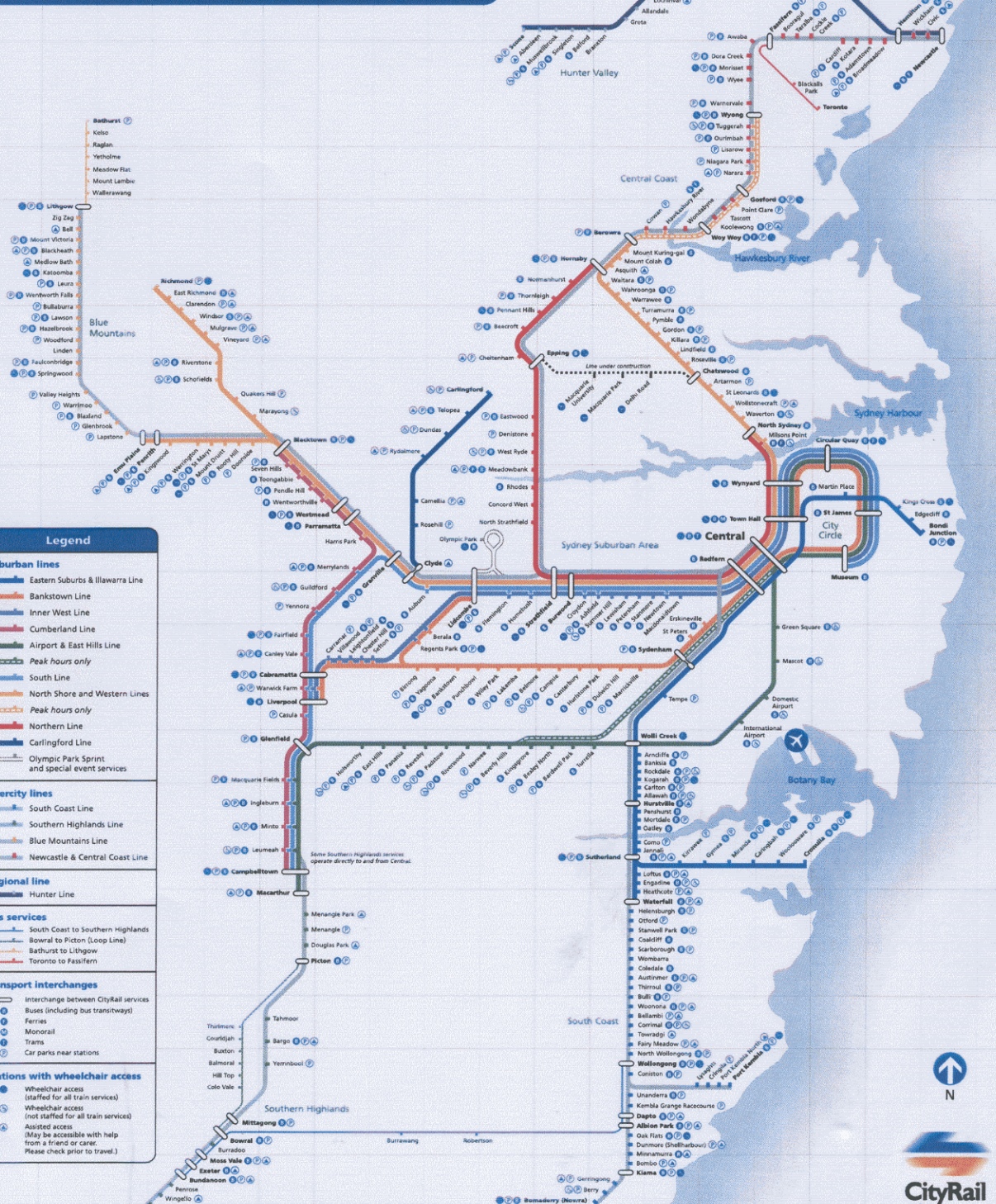
The frequency of the rail services travelling via Warwick Farm and Liverpool Stations is summarised in Table 5.2.

**TABLE 5.2 CITYRAIL SERVICES – LIVERPOOL STATION/  
WARWICK FARM STATION  
(NUMBER OF SERVICES BY RAIL CORRIDOR AND TIME PERIOD)**

Route	Time Period					
	4-6am	6-9am	9am-3pm	3-6pm	6pm-12am	12-2am
Liverpool → City via Bankstown	1	6	12	6	5	-
Liverpool → City via Regents Park	4	6	5	6	12	-
Liverpool → City via Fairfield	7	16	18	12	22 (19)*	1
Liverpool → Parramatta	-	2	-	-	-	-
Liverpool → Campbelltown	4	6	16	9	17	5
Parramatta → Liverpool	-	-	-	2	-	-
Campbelltown → Liverpool	6	10	16	6	19 (17)*	-
City → Liverpool via Bankstown	-	6	12	6	8	-
City → Liverpool via Regents Park	3	5	6	6	12	3
City → Liverpool via Fairfield	4	12	18	15	26	5
<b>Total</b>	<b>29</b>	<b>69</b>	<b>103</b>	<b>68</b>	<b>121 (116)*</b>	<b>14</b>

\* Reduced frequency at Warwick Farm

# CityRail network



**Legend**

**Suburban lines**

- Eastern Suburbs & Illawarra Line
- Bankstown Line
- Inner West Line
- Cumberland Line
- Airport & East Hills Line
- Peak hours only
- South Line
- North Shore and Western Lines
- Peak hours only
- Northern Line
- Carlingford Line
- Olympic Park Sprint and special event services

**Intercity lines**

- South Coast Line
- Southern Highlands Line
- Blue Mountains Line
- Newcastle & Central Coast Line

**Regional line**

- Hunter Line

**Bus services**

- South Coast to Southern Highlands
- Bowral to Picton (Loop Line)
- Bathurst to Lithgow
- Toronto to Fassifern

**Transport interchanges**

- Interchange between CityRail services
- Buses (including bus transways)
- Ferries
- Monorail
- Trains
- Car parks near stations

**Stations with wheelchair access**

- Wheelchair access (staffed for all train services)
- Wheelchair access (not staffed for all train services)
- Assisted access (May be accessible with help from a friend or carer. Please check prior to travel.)

www.cityrail.info  
Transport Infoline 131 500

Abbotsford	C11	Beverly Hills	O19	Carlingford	S14	Downside	K5	Geofford	F14	Keok	E2	Macarthur	T6	Mount Victoria	G2	Petersham	N12	Sewen Hills	L6	Tuggerah	E14	Wiley Park	O10
Adelaide	D17	Beverly North	Q11	Central Coast	J10	Dona Creek	D14	Glenburn	Z1	Merriota Grange	E12	Macquarie Fields	T6	Muggrave	H4	Picton	L6	Singamon	C11	Erasmussen	F12	Windsor	F14
Airport - Domestic	P15	Berrig	Q8	Carling	O15	Douglas Park	U6	Granville	M8	Rosemeadow	X12	Macquarie Fields	Q6	Muswellbrook	M16	Point Clare	G14	Springwood	J2	Turleba	Q12	Wingoh	Y4
Airport - International	B14	Blackburn Park	D15	Carriamar	O7	Durwich Hill	Q12	Green Square	O15	Kaurna	Y12	Maitland	B13	Muswellbrook	C11	Port Kembla	W14	St James	L16	Wentworthville	B11	Wingoh	B12
Airport Park	X12	Blackheath	C19	Cherry Hill	P6	Dundas	K9	Greta	C12	Kinross	I10	Maryland	K5	Marulan	Z3	Port Kembla - North	W11	St Leonards	J14	Wentworthville	Q13	Wingoh	B11
Airside	C12	Blacktown	K6	Centra	O12	Dunging	B11	Guilford	N7	Kings Cross	L17	Marronville	O12	Narrara	C14	Punctoon	O8	St Marks	K5	Unionsville	W12	Wingoh	W12
Alibon	R12	Blackland	K3	Cherrywood	J13	Dunmore	J13	Glyntha	S14	Kingstons	Q10	Marlin Place	L16	Narrabe	O10	Pymble	I13	St Peters	O13	Valley Heights	J2	Wentworthville	J14
Amfield	Q12	Blacktown	O12	Cherrywood	I10	Sheffield	X12	Hastton	C17	Kingstons	K1	Marlin Creek	B12	Newcastle	C18	Quakers Hill	J5	Stanwell Park	I12	Victoria Street	D14	Wentworthville	O13
Armidale	H11	Blacktown	Y12	Cherry Hill	O7	Sheffield	O7	Hastton	C17	Kingstons	K1	Marlin Creek	B12	Newcastle	C18	Quakers Hill	J5	Stanwell Park	I12	Victoria Street	D14	Wentworthville	O13
Ashfield	N12	Blackland	Y12	Cherry Hill	O7	Sheffield	O7	Hastton	C17	Kingstons	K1	Marlin Creek	B12	Newcastle	C18	Quakers Hill	J5	Stanwell Park	I12	Victoria Street	D14	Wentworthville	O13
Auburn	N12	Bondi Junction	M17	Cherry Hill	O7	Sheffield	O7	Hastton	C17	Kingstons	K1	Marlin Creek	B12	Newcastle	C18	Quakers Hill	J5	Stanwell Park	I12	Victoria Street	D14	Wentworthville	O13
Auburn	N6	Bongog	C19	Cherry Hill	O7	Sheffield	O7	Hastton	C17	Kingstons	K1	Marlin Creek	B12	Newcastle	C18	Quakers Hill	J5	Stanwell Park	I12	Victoria Street	D14	Wentworthville	O13
Automer	U12	Bowral	K5	Clyde	M8	Eastwood	K10	Headcote	T12	Larrikin	D14	Meadowbank	H2	Narrabe	C14	Revelstoke	O8	Sydney	O8	Wentworthville	H2	Wingoh	B11
Awaitah	C14	Braxton	O12	Coast	F12	Estesford	L17	Headcote	T12	Larrikin	D14	Meadowbank	H2	Narrabe	C14	Revelstoke	O8	Sydney	O8	Wentworthville	H2	Wingoh	B11
Barrack	W5	Brombeare	O17	Cook's Creek	C15	Ennis Plains	K3	Headcote	T12	Larrikin	D14	Meadowbank	H2	Narrabe	C14	Revelstoke	O8	Sydney	O8	Wentworthville	H2	Wingoh	B11
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Barrack	W5	Brombeare	O17	Cook's Creek	C15	Ennis Plains	K3	Headcote	T12	Larrikin	D14	Meadowbank	H2	Narrabe	C14	Revelstoke	O8	Sydney	O8	Wentworthville	H2	Wingoh	B11
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## 5.2 BUSES

The bus network which services the Liverpool CBD is principally provided by 4 private bus companies, namely Westbus, Metro Link, Busabout and Transit First.

The Parramatta – Liverpool Transitway comprises some 35 stops with service frequency being 10 minutes in peak periods, between 15 – 30 minutes in off-peak periods and 60 minutes at night. Patronage on this service has been increasing steadily over the past 2 years and is currently running at some 36,000 passengers per week.

There are a total of 24 bus routes which operate to Liverpool and all of these terminate at the Liverpool bus/rail interchange. Table 5.3 summarises the areas serviced by each of the bus routes while Figure 7 identifies the streets used by each service when approaching and departing the Interchange.

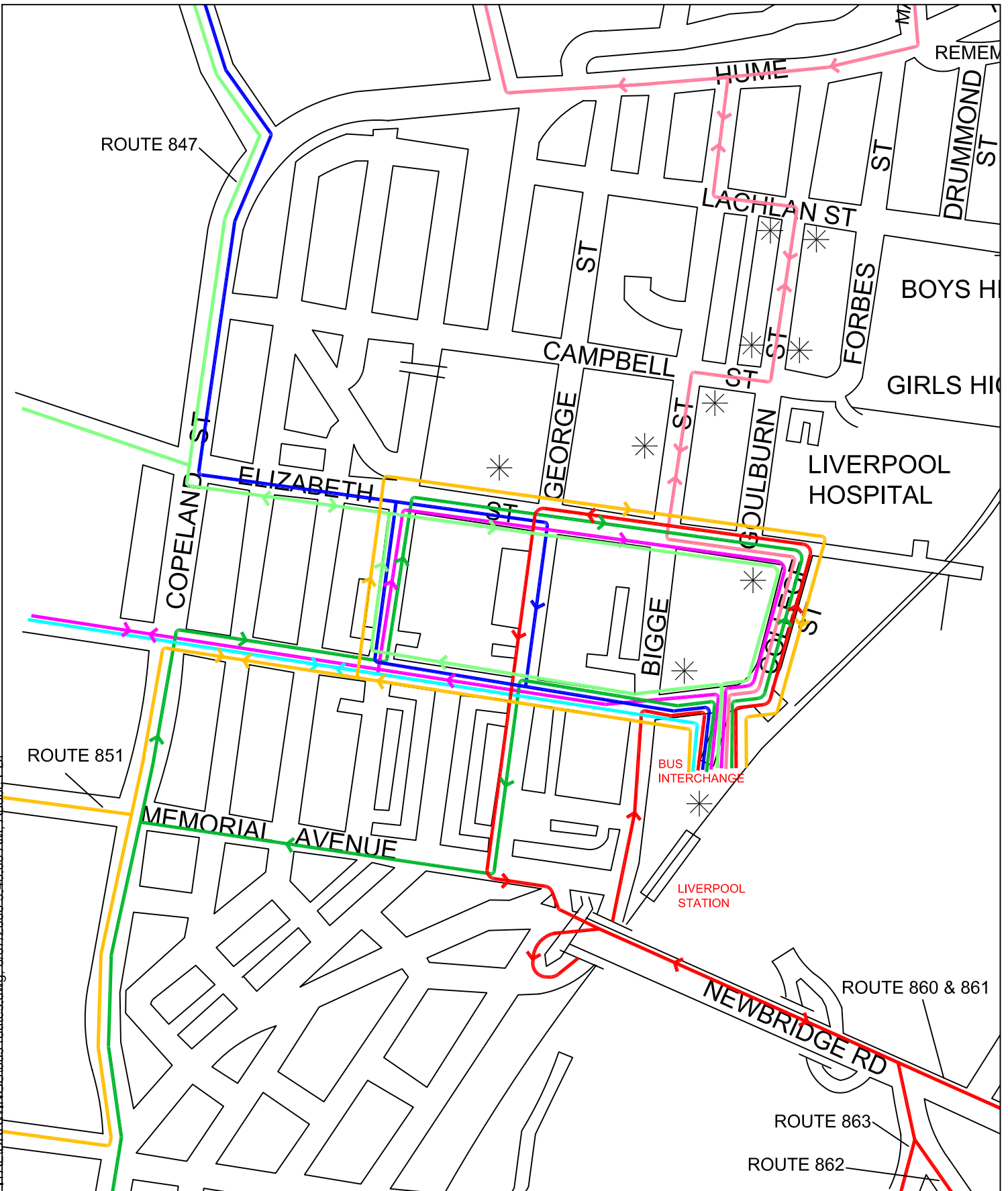
<b>TABLE 5.3 EXISTING BUS SERVICES OPERATING WITHIN LIVERPOOL CBD</b>			
<b>Route No</b>	<b>Operator</b>	<b>Destination via</b>	<b>Operation</b>
800	Westbus	Parramatta via Canley Heights, Wakeley, Woodpark and Merrylands	6 days per week
835	Westbus	Penrith via Mt Vernon, Erskine Park, UWS Werrington	5 days per week
836	Westbus	Badgerys Creek via Cabramatta Road and Kemps Creek	6 days per week
841	Metrolink	Cecil hills via Bonnyrigg Heights and Heckenberg	6 days per week
842	Metrolink	The Valley Plaza via Sadleir, Miller, Busby and Hinchinbrook	Full time
843	Metrolink	Mt Pritchard	Full time
844	Metrolink	The Valley Plaza via Ashcroft, Heckenberg, Busby	Full time
845	Metrolink	The Valley Plaza via Bonnyrigg, Green Valley and Mt Pritchard	Full time
847	Metrolink	Orange Grove Estate via Liverpool Hospital	Full time
849	Metrolink	Warwick Farm via Liverpool Hospital	6 days per week
850	Busabout	Camden via Lurnea and Leppington	Full time
851	Busabout	Miller via Cartwright	Full time
852	Busabout	Carnes Hill via Horningsea Park, Prestons and Lurnea	Full time
853	Busabout	Rutleigh Park via Austral, West Hoxton and Cartwright	Full time

Route No	Operator	Destination via	Operation
860	Transit First	Bankstown via Moorebank and Milperra	6 days per week
861	Transit First	Holsworthy via Chipping Norton	Full time
862	Transit First	Holsworthy via Moorebank and Hammondville	Full time
863	Westway	Holsworthy via Wattle Grove	Full time
864	Busabout	Ingleburn via Casula, Glen Regent, Glenfield and Macquarie Fields	Full time
866	Busabout	Ingleburn Station via Denham Court and Links Estate	6 days per week
867	Busabout	Prestons via Casula Mall	Full time
869	Busabout	Churchill Gardens via Lurnea	Full time
T80	State Transit	Parramatta via Miller, Bonnyrigg, Prairiewood, Smithfield and Mays Hill	Full time

Whilst the services operated by each company ensures good connectivity between adjoining districts/suburbs and the CBD and cross regional services to centres such as Penrith, Castle Hill, Parramatta and Blacktown are adequate, the frequencies provided reflect the moderate patronage levels which are achieved on most services. The underutilisation of this mode of transport is demonstrated in journey to work data for the Liverpool CBD which indicates that of the workers in the Liverpool CBD only around 5% travel by bus, even though almost 30% of workers reside in the Liverpool LGA.

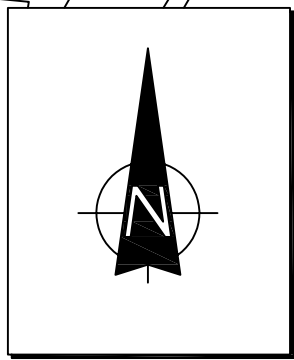
### 5.3 FUTURE CIRCUMSTANCES

The key proposed changes to the public transport network serving Liverpool over the next 5 – 10 years primarily involve the completion of the North-West Bus Transitway corridors and implementation of CityRail’s \$1.5 billion Rail Clearways project. The existing Parramatta – Liverpool Transitway is the first of three dedicated and interconnected bus only transport corridors to be provided for Western Sydney with the remaining two (currently under construction) to operate between Parramatta and Rouse Hill via Parklea and between Blacktown and Parklea.



**LEGEND**

	ROUTE 860, 861, 862, 863
	ROUTE 864, 866, 867, 869
	ROUTE 800, 835, 836
	ROUTE 853, 854, 855
	T80
	ROUTE 850, 851, 852
	ROUTE 841, 842, 843, 844, 845, 847
	ROUTE 849
	BUS STOP



**BUS ROUTES**

**FIG 7**

The Rail Clearways project proposes to separate the networks 14 metropolitan rail routes into 5 independently operated clearways or corridors (refer to map overleaf). Fifteen major projects involving the construction of additional tracks, platforms, turnbacks and crossing loops have been identified as integral to achieving the 5 clearway corridors. These projects are intended to remove bottlenecks and junctions, reduce congestion and delays and allow for simpler timetables for more reliable and frequent services.

Achieving these outcomes will also result in an overall increase in the in the capacity of the CityRail network and theoretically minimise the potential for one incident on part of the rail network from affecting services on other clearways (corridors).

Of the 15 key projects identified in the Rail Clearways planning, the most relevant to Liverpool is the proposal to construct an additional platform (and turnback) at Liverpool to reduce peak hour congestion and enable improved timetabling of the Bankstown Line.

Following planned completion of the Rail Clearways project in 2010, CityRail propose to introduce a new timetable in 2011 for the entire network to take advantage of the benefits gamed for the Clearways.

## 6. TRANSPORT MANAGEMENT AND ACCESS PLAN

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### 6.1 PROJECT CONTEXT

The 'strategic context' is identified in Section 1 while 'future development' is dealt with in Section 3 and the existing/future 'public transport services' are identified in Section 5.

### 6.2 OBJECTIVES AND TARGETS

The existing Liverpool Hospital is a significant generator of motor vehicle movements and the estimated current traffic generation during the morning and afternoon 'on-street' peak periods is as follows:

AM	PM
800 vtp/h	750 vtp/h

Staff represent the predominant element of the hospital traffic generation and the projection is that staff will increase by some 60% with the envisaged hospital development. Some elements of the road system serving Liverpool CBD already operate at levels approaching capacity during the peak periods and:

- \* there are no proposals (or opportunities) to increase the road system capacity
- \* there are proposals to significantly increase other development in the CBD which will increase traffic generation in the centre.

If the existing mode share for travel by private motor vehicles is maintained with the hospital development then the total traffic generation of the hospital will increase by some 72.5% (ie staff, patients, VMO and visitors) to 1,380 vtp/h (AM peak) and

1,237 vtpm (PM peak). Such an outcome would be undesirable particularly if the existing site access provisions are retained with the development.

Reference to the results of surveys at other major hospitals reveals the following travel mode comparisons:

	<b>St George</b>	<b>Concord</b>	<b>Liverpool</b>
<b><u>Staff</u></b>			
Car driver	50%	66.5%	80.0%
Car passenger	15%	15.5%	6.5%
Bus	NA	11.2%	2.5%
Train	NA	1.5%	8.0%
Other	NA	6.8%	3.0%
<b><u>Patients</u></b>			
Car driver	75%	57.4%	58%
Car passenger	5%	6.4%	21%
Bus	NA	13.8%	7%
Train	NA	-	9%
Other	NA	22.4%	5%
<b><u>Visitors</u></b>			
Car driver	NA	76.3%	50%
Car passenger	NA	0.8%	21.5%
Bus	NA	15.8%	7%
Train	NA	-	20%
Other	NA	7.1%	1.5%

It is noted that St George has good access to rail and reasonable bus servicing while Concord has poor access to rail and limited bus servicing. Liverpool has good access to both rail and bus services while it is apparent that public parking availability at Liverpool Hospital is limited for patients and visitors. It is also apparent from the questionnaire data for Liverpool Hospital that day/outpatients and visitors movements do not occur to any great extent during the on-street peak traffic periods.

A contemporary TMAP approach with major developments to this issue is to establish a 'travel mode' goal and to devise the means to encourage/enforce the identified travel mode outcome.

The existing mode split for use of public transport by patients and visitors at Liverpool Hospital is quite satisfactory with 'car driver' being 58% for patients and 50% for visitors. A desirable objective of the TMAP would be to achieve a minimum 10% to 15% reduction in the mode split of staff 'car driver' which is currently 80%.

The hospital however, presents some particular considerations in regard to travel mode objectives for staff which are not generally in common with other 'work places', namely:

- \* there are a significant proportion of 'early morning' starts, as well as 'night/ weekend' and 'split shifts' for staff (ie issues of safety and service frequency)
- \* the public transport infrastructure is largely yet to be developed into the new south-west sector release areas which are a significant part of the hospitals catchment
- \* the significant increase in residential apartments in Liverpool CBD will bring about an increase in hospital workers living nearby and walking to work as well as patients and visitors

The proposed 'mode split goal' of the TMAP for Liverpool Hospital development is as follows:

	<b>Staff</b>	<b>Patients</b>	<b>Visitors</b>
Car driver	68%	55%	50%
Car passenger (inc SD/PU, taxi)	10%	20%	18%
Train	12%	10%	20%
Bus	5%	10%	10%
Walk	5%	5%	2%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

### 6.3 SCALE OF INVESTIGATION

The proposed Liverpool Hospital redevelopment is classified as a 'medium site' under the TMAP guidelines indicating a Type 4 assessment (ie not requiring transport network modelling).

Measures which can be enacted to encourage the mode share goal outcome would include:

- \* improved access/amenity to the nearby railway stations:
  - generous footways and pedestrian crossings
  - good lighting/surveillance
  - shelter where possible
  
- \* improved access/amenity to the bus services:
  - good shelters
  - good lighting/surveillance
  - increased frequency/capacity services
  - more convenient stop location (eg Elizabeth Street eastbound at hospital).
  
- \* implementation of a meaningful 'Transport Plan'. Examples of comparable plans for RPA etc are provided in the Supplementary Papers
  
- \* encouraging car pooling (potentially with financial incentives through the mechanism already employed for charging staff for carparking)
  
- \* improved provision for pedestrian and cyclist access with bicycle storage facilities.
  
- \* Introduction of a Work Place Travel Plan

It is noted that the ongoing increase in development of residential apartments within the CBD will increase the 'walk' mode while the potential for a subsidised shuttle bus service to the railway stations is also a possibility.

It is also noted that recommendations of Liverpool Council's Parking Study included:

- \* extension of period parking restrictions on the CBD road system
- \* introduction pay parking (meter or ticket) on the CBD road system.

The study did not specify the extension of these provisions to the streets in the immediate vicinity of the hospital apart from the introduction of 4 hour parking to preclude commuter parking particularly in the north-east sector (Warwick Farm precinct).

However, the introduction of such restrictions will act to reduce the available on-street parking for 'all day' commuters and increase the availability of parking for short stay (eg hospital visitors and day/outpatients. The introduction would also act to reduce the available on-street parking opportunities for staff (not accommodated or wishing to pay for on-site parking) and thereby act to increase the mode share for public transport.

#### **6.4 IMPLICATIONS FOR PUBLIC TRANSPORT SERVICES**

The existing peak arrival and departure patterns of staff, patients and visitors in terms of 'concurrent movements in 1 hour' are as follows:

<b>Morning (8.00 – 9.00am)</b>	<b>IN</b>	<b>OUT</b>	<b>TOTAL</b>
Staff	552	168	900
Patients/visitors	131	17	138
<b>Afternoon (4.30 – 5.30pm)</b>	<b>IN</b>	<b>OUT</b>	<b>TOTAL</b>
Staff	225	450	844
Patients/visitors	10	120	130

With the current mode split to train and bus this would translate to the following existing peak passenger numbers per hour:

	Morning Arrival		Afternoon Departure	
	Staff	Patients/Visitors	Staff	Patients/Visitors
Train	47	24	40	22
Bus	15	10	13	9

The projected changed demands consequential to the hospital redevelopment and the TMAP mode split goals are as follows:

**CONCURRENT 1 HOUR MOVEMENTS**

Morning Arrival	Train	Bus
Staff	113 (47)	48 (15)
Patients/visitors	41 (24)	17 (10)
<b>Afternoon Departure</b>		
Staff	96 (40)	42 (13)
Patients/visitors	38 (22)	16 (9)

The projected increased peak directional passenger movements per hour consequential to the hospital development and mode share changes will be:

	Morning Arrival		Afternoon Departure	
	Staff	Patients/Visitors	Staff	Patients/Visitors
Train	66	17	56	16
Bus	33	7	29	7

It is apparent that the existing and proposed rail and bus services will be quite adequate to accommodate these increased demands particularly as the arrival and departure of hospital workers, patients/visitors is ‘counter’ to the bulk of commuter movements for train services at Liverpool (ie out in morning and return in evening).

**Work Place Travel Plan**

The hospital will investigate implementation of a Work Place Travel Plan for the hospital, developed to achieve travel demand management practices to meet the

specific needs of the site and its employees. These needs, including employee numbers, hours of work, shift times, etc., will be included in the Work Place Travel Plan to encourage the use of public transport.

The hospital will promote with prospective tenants the benefits of the Work Place Travel Plan incorporating car pooling, shift times, bicycle use and public transport.

The Work Place Travel Plan will encourage specific travel behaviour programs aimed at supporting travel modes other than private cars. The Work Place Travel Plan will include initiatives such as:

- \* encouraging public transport through improved bus services and the provision of conveniently located bus stops
- \* working with operators and public transport providers to improve services
- \* encouraging public transport use through provision of information (maps and timetables)
- \* improving pedestrian facilities which make it easier and safer to walk to the site from other developments and/or public transport modes
- \* raising awareness of health benefits of walking (including maps showing walking routes)
- \* introducing and promoting car-sharing and car pooling schemes with each of the tenants and its employees
- \* encouraging cycling by promoting the use and awareness of secure bicycle parking, lockers, showers and change facilities with the hospital
- \* supporting flexible work practices such as tele-working, tele-conferences and promoting shift hours which encourage staff to travel to/from work outside of peak periods

- \* financial incentives
- \* appropriate on-site parking provision
- \* information for visitors to the businesses
- \* managing use of couriers and deliveries to minimise service vehicle trips and to encourage service vehicles to travel to/from the site outside of peak periods

The Work Place Travel Plan will assist in delivering sustainable transport objectives by considering the means available for reducing car use and encouraging the use of public transport.

## 7. ACCESS

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### 7.1 VEHICLE ACCESS

The issues of consideration relative to the existing vehicle provisions at the hospital site are:

- \* the sensitivity of the road frontages near the hospital (ie schools, high density residential, TAFE, park, the hospital itself and the heightened pedestrian environment)
- \* the congested conditions on the CBD core roads which will increase as the other envisaged development occurs
- \* the desirability of encouraging and providing access to/from the hospital without passage through the CBD road system
- \* the desirability of having a dedicated and unimpeded access connection to the Hume Highway
- \* the impending constraint on use of the railway level crossing and, with the proposed increase of staff parking on the eastern sector, the desirability of having efficient direct access to the new railway (bridge) crossing point
- \* the residential the origins of staff, patients and visitors.

#### New North Link Road

With all of these factors in mind and particularly the impact of the increase traffic generation of the hospital development it is apparent that the preferred outcome would be to establish a new direct road link northwards from the hospital along side

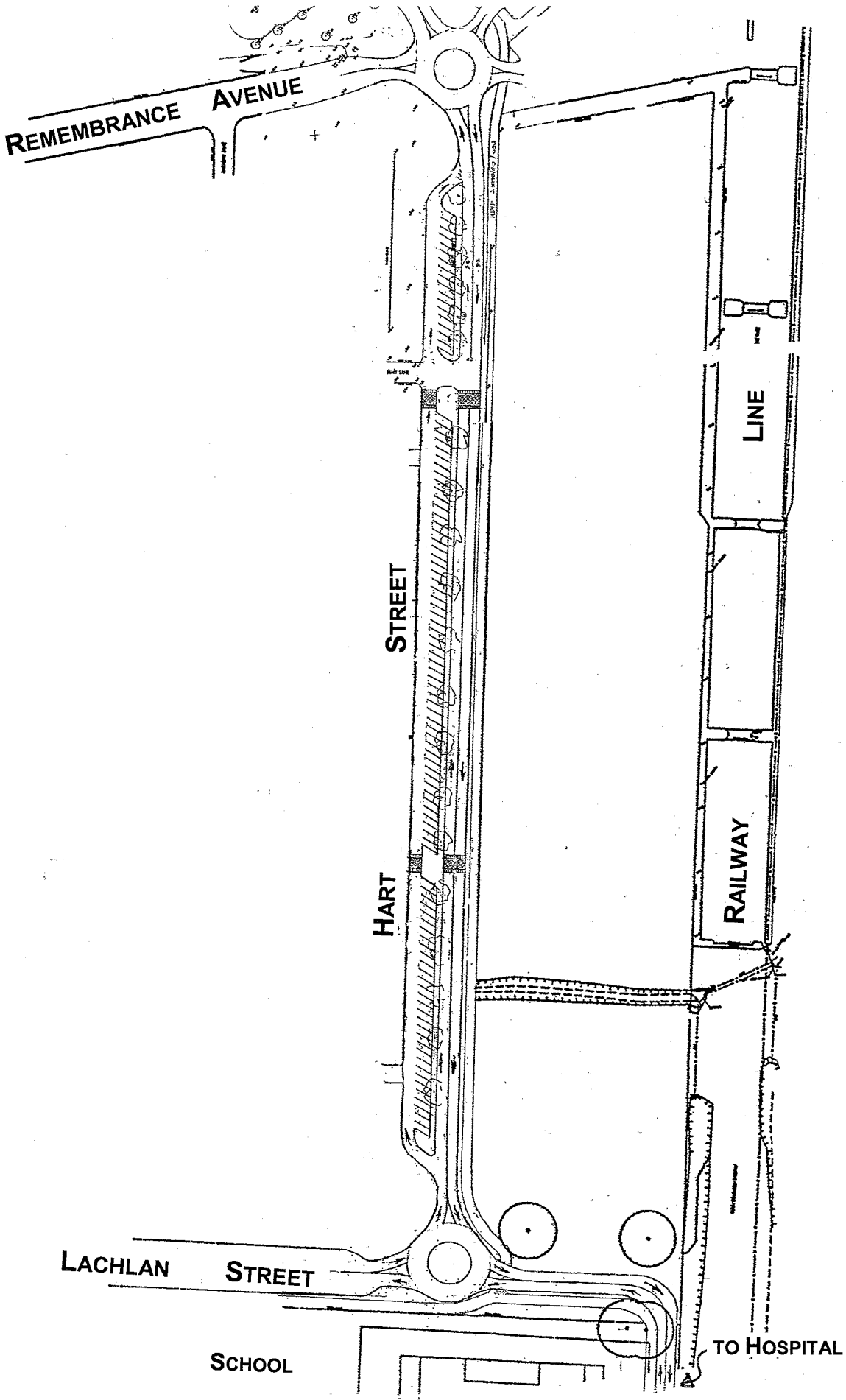
the railway line connecting to the Hume Highway. This envisaged link is shown on Figure 8 while the potential form of the access intersection on the Highway is shown on Figure 9.

The establishment of this new access roadway will require acquisition of land along the eastern edge of the schools and rearrangement of the commuter carparking. The 'levels' for connection to the Highway are quite suitable although sight distance provisions need to be further assessed.

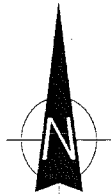
Due to the extensive ongoing development process for the hospital it is possible that a staged access arrangement would involve a temporary connection through the existing Hume Highway/Remembrance Avenue intersection.

The benefits of this proposal are:

- \* the hospital is provided with a direct connection with the Hume Highway arterial route which links to the other major routes serving the Region
- \* access for ambulance vehicles will be facilitated and a direct signposted access route is provided for other emergency arrivals
- \* increased traffic flows on the sensitive road frontages at the western side of the hospital are avoided
- \* there will be greater flexibility of access and access movements are further dispersed
- \* service vehicles will have access which is not reliant on residential or CBD streets
- \* better surveillance is provided for pedestrian movements to/from Warwick Farm Railway Station.

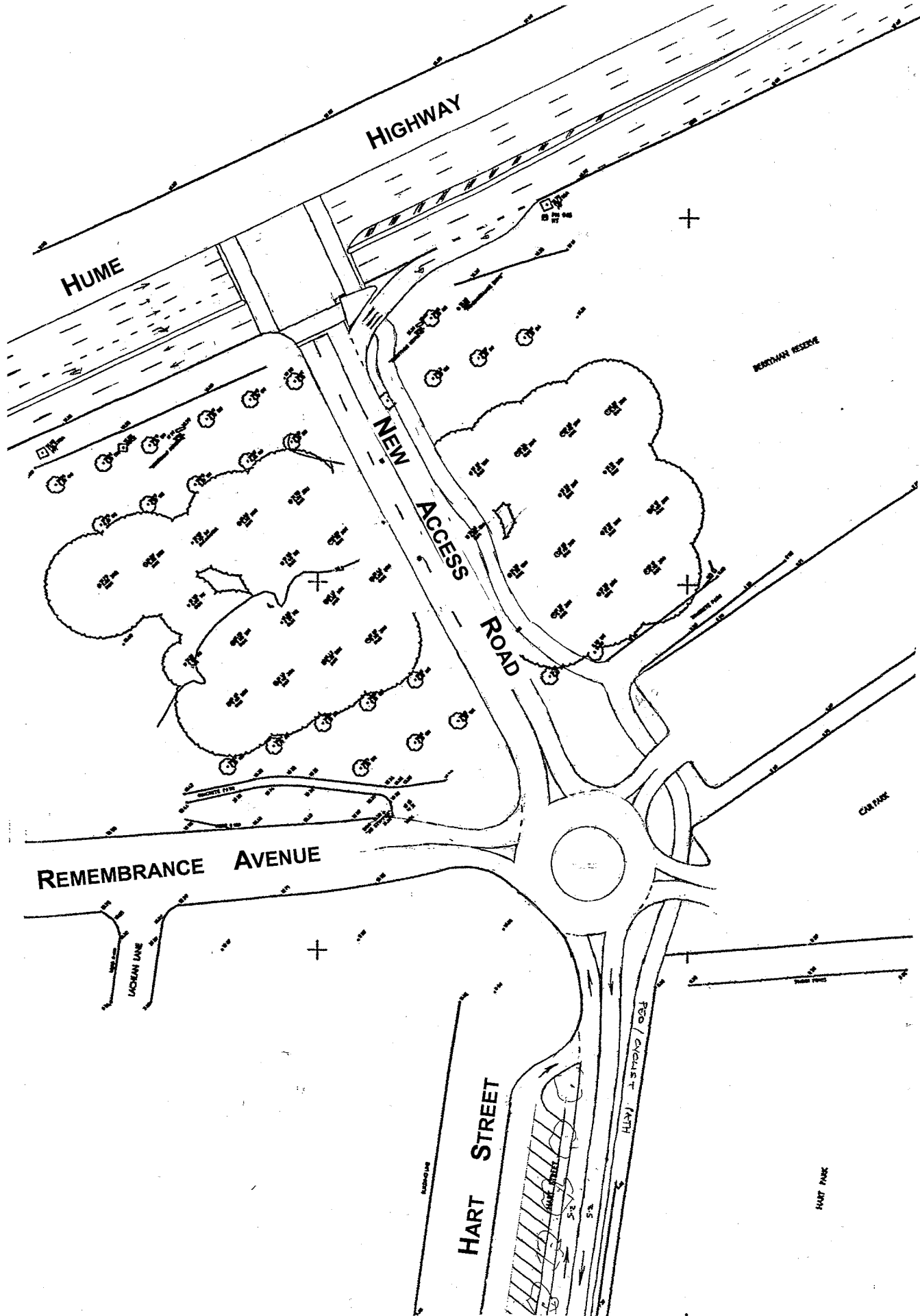


LEGEND

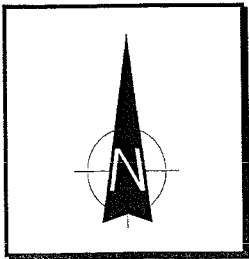


PROPOSED ACCESS  
ROAD

FIG 8



**LEGEND**



**PROPOSED INTERSECTION  
ARRANGEMENT  
FIG 9**

## 7.2 PEDESTRIAN AND CYCLIST ACCESS

Upgraded pedestrian access to the railway stations will be essential and the proposed new access road will incorporate a generous footway/bicycle provision along the western side. Other important considerations for design will be:

- \* the provision of an elevated pedestrian connection over the railway line
- \* the provision of convenient access/circulation provisions through the site
- \* the provision of a pedestrian/bicycle provision along the western side of the railway (through the site).

## 7.3 INTERNAL CIRCULATION

The principal issue in relation to internal vehicle circulation is the crossing of the railway corridor between the western and eastern parts of the site. At the present time there is an 'at grade' signal/gate controlled crossing point on the access road which runs along the southern boundary from Elizabeth Street.

The introduction of the Southern Sydney Freight Line and the Liverpool Turnback project will result in there being 4 separate rail tracks at the Liverpool Hospital level crossing. Rail Corp has undertaken an assessment of the future implications for the crossings (Section 6 of Supplementary Papers) and this assessment concluded that with the frequency and duration of future rail services vehicles will not be able to use the crossing for periods of between 30 and 50 minutes each hour.

Rail Corp contend that the crossing cannot continue to operate for normal vehicle movements associated with the hospital and details of the proposed development of the rail corridor are provided in Section 9 of the Supplementary Papers. With the proposed redevelopment and extension of parking on the eastern part vehicle movements over the rail line will increase significantly. It is therefore essential that a grade separated crossing is provided as part of the redevelopment scheme.

## 8. PARKING

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The current normal peak parking demands on-site by staff occur between 1.00pm and 2.00pm as follows:

	<b>Staff Pass</b>	<b>5 Day Pass</b>	
Campbell Street	308	131	
Clinical Building	19	-	
Eastern Sector	488	75	
Health Services	23	-	
<b>Total</b>	<b>838</b>	<b>206</b>	<b>1044</b>
<b>No provided on site</b>			<b>1120</b>
<b>On-Street</b>	<b>160</b>		
<b>Grand Total (say)</b>	<b>1200</b>		

There are currently some 1,852 passes issued while at the same time there is a substantial waiting list for staff wanting a parking pass (estimated at some 500 persons) many of whom currently park on-street.

Data is not available at the present time in relation to the exact 'make up' of future staff numbers for the hospital development or their start and finish times. It is however, a reasonable approach to pro-rata the existing staff characteristics with the projected future quantum of staff as follows:

Existing total FT staff	3,030	
Existing peak staff parking	1,044 (on-site)	1,200 total
Future total FT staff	4,880 (+ 58.4%)	
Future peak staff parking	1,200 @ 158.4%	1,900 spaces
If travel mode to 'car driver' is reduced to 65%		1,540 spaces
Plus allowance for peaking margin (say 200 spaces)		1,740 spaces

At the present there are only 273 spaces available on-site for visitors/day patients. These spaces are heavily utilised and there is some use by staff of these spaces (through the issue of 5 day passes etc). However, it is apparent that the peak demand only occurs for some 4 hours during the middle of the day (10.00am to 2.00pm).

There is a real viability issue in relation to the funding of 'structured' carparking for patients and visitors when the spaces are only fully utilised for 4 to 5 hours per day (on weekdays). It is not possible to establish the existing maximum number of day/out patients or visitors in attendance at the hospital at one time.

However, it is envisaged that:

- \* beds will be increased by some 60%
- \* day only separations will be increased by 76%
- \* non-patient occasions of service will increase by some 60%
- \* overnight separations will increase by some 56%.

The mode share for 'car driver' for day/out patients and visitors is quite reasonable at present and would be expected to remain at the 50 to 55% level in the future. If it is adjudged that a provision of some 300 parking spaces for day/out patients and visitors is reasonable at the present time then the assessed pro-rata future provision (having regard for the increased beds and services) would be +55%-60%. Accordingly, the future provision would be some 465-480 spaces.

The potential introduction of 'period parking' restrictions on the streets in the vicinity of the hospital (with or without meter/ticket controls) will act to increase the availability of on-street parking for hospital visitors and day/out patients.

The proposed on-site parking provision will comprise:

	<b>Present</b>	<b>Proposed</b>	<b>Variance</b>
Visitors/patients	276	480	+74%
Staff	1120	1740	+55%
VMO	20	32	+60%
AHS	90	140	+56%
<b>Total</b>	<b>1506</b>	<b>2392</b>	

## 9. TRAFFIC IMPLICATIONS

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The traffic movements generated by the hospital during the morning and afternoon peak commuter periods are very largely comprised of staff 'car driver' movements. Surveys have revealed that these movements are some 700 vtpm in the morning and some 650 vtpm in the afternoon with patients and visitors being some 100 vtpm in the morning and afternoon.

The present 'staff car driver' mode is some 80% 'across the board' and without a breakdown to shift time (ie the mode share for the 8.00 – 9.00am shift start would be less than that for the 5.00 – 6.00am shift start). However, for the purpose of a generalised assessment the following is applied:

### EXISTING STAFF CAR DRIVER MOVEMENTS (80%)

AM	PM
700	650

### FUTURE CAR DRIVER MOVEMENTS (STAFF +58.4% @ 65%)

	AM	PM
Staff	940	870
Patient/Visitor	260	200
Total Movements	1200 vtpm (800)	1070 vtpm (750)

( ) existing

The future (post development) traffic generation will retain a similar arrival/departure split as follows:

	AM	PM
IN	960	270
OUT	240	800

The directional distribution of vehicle movements will be influenced by:

- \* the new northern road link connection to Hume Highway
- \* the closure of the railway level crossing on the extension of Elizabeth Street.

Having regard to the origins of staff, patients and visitors (see Section 2.2) it is apparent that some 45% of future vehicle movements will occur along the new northern road link as follows:

	<b>AM</b>	<b>PM</b>
IN	432	120
OUT	108	360
<b>TOTAL</b>	<b>540</b>	<b>480</b>

Thus the access movements through the existing western road system will reduce from the existing levels as follows:

	<b>AM</b>		<b>PM</b>	
	<b>Existing</b>	<b>Future</b>	<b>Existing</b>	<b>Future</b>
	800	660	750	590

The access movements at the new intersection on the Hume Highway will be 'discounted' by the existing hospital related movements along this section of the Highway and the projected access movements are as follows:

		<b>AM</b>	<b>PM</b>
Hume Highway	Eastbound	2192	1518
	Right-turn	260	72
	Westbound	1582	2399
	Left-turn	172	48
Access	Right-turn	43	144
	Left-turn	65	216

The operational performance of this section of the Hume Highway with the new intersection and the projected traffic demands has been assessed using SCATES. The results of that assessment are summarised in the following:

	AM			PM		
	LOS	DS	AVD	LOS	DS	AVD
Hume H'way/Bigge St	B	0.74	20.6	B	0.73	23.2
Hume H'way/Remembrance Ave	A	0.82	10.8	A	0.83	12.8
Hume H'way/Access	A	0.66	11.1	B	0.85	15.1

These results indicate that all intersections will operate quite satisfactorily under the changed circumstances.

During the discussions with the RTA in relation to the new access intersection it was suggested that consideration be given to closing Remembrance Avenue at the Hume Highway in conjunction with provision of the new intersection (i.e. Hume Highway/Mannix Avenue as a T junction). That option has also been modelled using SCATES and the results are summarised in the following:

	AM			PM		
	LOS	DS	AVD	LOS	DS	AVD
Hume H'way/Bigge St	B	0.74	20.6	B	0.73	23.2
Hume H'way/Mannix Ave*	A	0.54	6.5	A	0.54	5.9
Hume H'way/Access	B	0.74	16.4	B	0.94	27.7

*\* 3 lanes eastbound*

The results of this optional arrangement indicate that satisfactory operational performance will be achieved if it is decided to close the Remembrance Avenue link.